Received: 19 August 2015 | Revised: 18 August 2016 | Accepted: 3 October 2016

DOI: 10.1111/faam.12151

WILEY

ORIGINAL ARTICLE

Environmental management accounting in local government: Functional and institutional imperatives

Wei Qian[1] | **Roger L. Burritt**[2] | **Gary S. Monroe**[3]

[1]University of South Australia, Adelaide, South Australia, Australia

[2]University of Kassel, Kassel, Germany

[3]University of New South Wales, Sydney, New South Wales, Australia

Correspondence
Wei Qian, School of Commerce, Division of Business, University of South Australia, SA 5001, Australia.
Email: wei.qian@unisa.edu.au

Abstract

The challenge of using environmental management accounting (EMA) tools such as full-cost accounting to improve waste and recycling management has been acknowledged for over a decade. However, research on assessing and understanding local government use of EMA, especially broader levels of EMA, is lacking. This study investigates the link between the nature and drivers of EMA practice for waste and recycling services based on a survey conducted with local governments in New South Wales, Australia. The study finds that although social and organisational factors are related to the uptake of EMA, local governments are subject to stronger functional demands than institutional pressures in their use of more expansive EMA such as indirect and external costs and impacts. This implies that the use of EMA in local government is viewed more as an adaptive activity to cope with functional challenges and achieve efficiency, than as an institutional imperative to achieve social acceptance.

KEYWORDS

contingency theory, environmental management accounting, institutional theory, local government, waste and recycling management

1 | INTRODUCTION

Public sector organisations have increasingly been encouraged to take greater environmental responsibility (Frost & Seamer, 2002). Recent attention has been given to the use of environmental accounting, particularly environmental management accounting (EMA) to support environmental decision-making by local government (Ball, 2005; Qian, Burritt, & Monroe, 2011). As local government is in a better position than central and state governments to make progress on sustainable development at the community level, it has potential to be at the vanguard of the development of EMA (Ball & Craig, 2010). One of the essential environmental services provided by local government is waste and recycling management financed through council rates and levies (Ball, 2005; Lewis, 2000). This study investigates the uptake

of different levels of EMA for local government waste and recycling services and functional and institutional factors associated with such uptake.

With increasing threats of waste disposal to long-term sustainability and the declining financial health of local government, various calls have been made to broaden collection of waste information. These include promotion of life-cycle assessment and integration of economic and environmental costs into waste management in Europe (European Commission, 2009); full-cost accounting for waste and recycling services in the USA (USEPA, 1997); and introduction of charges reflecting full economic and environmental costs of waste disposal in Australia (AESDSC, 1992). Yet, collection and use of EMA information remains a challenge, particularly for less-visible costs such as waste and recycling flows, future clean-up costs and environmental impacts of disposal alternatives hidden in overheads (USEPA, 1995; Qian et al., 2011). Combining monetary, physical, hidden and external costs and impacts adds further layers of complexity.

To understand EMA development in organisations, Parker (1997) and Qian and Burritt (2009) suggested the use of a contingency lens as an organisation's structural arrangements and management procedures can be subject to the contexts in which it operates. These contexts can involve an immediate technical environment where functional demands persist, and a wider social environment where institutional pressures form. For example, Qian and Burritt (2009) and Christ and Burritt (2013) claimed that the level of engagement of an organisation with EMA tools depends on different functional contingencies such as service complexity, environmental uncertainty and strategic priority. Getting the right fit with these functional demands allows the organisation to improve efficiency and reach targeted performance (Chenhall, 2003). In contrast, Ball (2005) and Ball and Craig (2010) used institutional theory to explore social imperatives such as social environmental movements and cultural expectations. They conceptualized EMA changes within a wider institutional environment which they contended has shaped an organisation's environmental behaviour and commitments.

In practice, it is likely that technical rationales and institutional influences coexist in driving EMA development (Qian et al., 2011), and their relative strengths (Scott, 1995) may influence the use of a broader or narrower EMA. Bouma and van der Veen (2002) stressed that the diverse contextual elements should be studied together to understand complex EMA issues such as those applied in managing waste and recycling services. For local government, institutional pressures could be stronger because of the need to maintain social legitimacy for the provision of public services. Nevertheless, with the introduction of New Public Management, public sector organisations are seen to move towards performance-driven management settings, strengthening technical demands for efficiency (Broadbent & Guthrie, 2008). Research to date provides no indication of or agreement on the relative roles of functional and institutional imperatives for EMA development in the public sector. These roles need to be examined if messages for EMA development in local government are to emerge.

A survey is used to collect data in New South Wales (NSW) Australia. Australia is among the highest generators of waste per capita in the developed world. Its landfills receive around 22 million tonnes of waste each year and per capita waste generation has increased at an annual rate of 5% (ABS, 2011). Since the government introduced the National Strategy for Ecologically Sustainable Development (NSESD) in 1992 and embraced the importance of accounting tools for waste management (AESDSC, 1992), government spending on waste management has been over $2.2 billion each year (ABS, 2011). Australian local government has actively responded to the NSESD call with 86% of total capital spent on solving increasingly complex waste and wastewater problems (ABS, 2004). As such, focussing on EMA development for waste and recycling services in Australia is of use to policy development in this area.

This study makes two contributions. First, investigation of different levels of EMA use in the context of waste and recycling management provides a foundation for better practical policymaking. Past studies examine EMA use with either a narrower or broader level of information. Examples include narrow monetary-oriented EMA (Bartolomeo et al., 2000; Frost & Seamer, 2002), broader physical (e.g. material) flow analysis and costing (Strobel & Redmann, 2002), and most broadly, hidden costs and external life-cycle measures (Ferreira, Moulang, & Hendro, 2010; Qian et al., 2011). These differences in the dimensions and levels of EMA have not previously been theoretically anchored and may have led to oversimplified policy suggestions for waste and recycling management.

Second, emphasis on relative roles of technical and institutional demands helps pinpoint areas where improvements can be made. For example, whether policy measures supporting internal improvements such as assisting local government in developing waste-management strategies and performance measurement tools are most effective for EMA development, or whether it would be better to resource government regulation and community empowerment.

The remainder of the paper is structured as follows. Section 2 explains different perspectives on EMA development and establishes the theoretical foundations. Section 3 details the research method employed, followed by findings in Section 4. Section 5 discusses the implications for practice and theory/policy. Finally, Section 6 identifies limitations and suggestions for future research.

2 | TWO PERSPECTIVES ON EMA DEVELOPMENT

2.1 | Functional imperatives for EMA adoption

To maintain or accomplish its performance objectives, an organisation must respond to functional imperatives for efficiency in its immediate technical/operational environment, for example, strategic choice, technology, scale, resources (Chenhall & Langfield-Smith, 1998). When considering the connection between accounting and the environment, research specifically links EMA with three functional imperatives: environmental uncertainty, strategic proactivity and operational complexity.

2.1.1 | Environmental uncertainty

Organisations are regarded as adaptive rational systems that have the ability to interact successfully with their dynamic and uncertain environments (Ewusi-Mensach, 1981). In most circumstances, rationality requires the least risky solutions and minimum uncertainty. When organisational environments become more dynamic and uncertain, decisionmakers tend to seek and process a greater amount of information to reduce uncertainties (Lal & Hassel, 1998). Chenhall and Morris (1986) found that a broader level of accounting information and timely information management are perceived to be more useful and applicable when organisations face uncertain environments. If managers perceive organisational environments as highly uncertain, they are more likely to acknowledge the importance of external, non-financial (i.e. physical), ex-ante (i.e. future-orientated) accounting information rather than information of a purely financial and ex-post nature (i.e. historical) (Lal & Hassel, 1998). EMA incorporates such non-financial, ex-ante, externally orientated information relating to the environmental impacts of an organisation (Schaltegger & Burritt, 2000). With green agendas gaining momentum, organisational environments relating to ecological issues have become increasingly dynamic and unpredictable. In such settings, decisionmakers are likely to use environmental accounting information as a coping reaction to ensure service efficiency and targeted performance outcomes (Parker, 1997). Issues such as uncertain waste disposal alternatives and costs, changing landfill sites and fluctuating recycling market demands impose pressures on environmental managers. The broader level of information that EMA offers can be used to assess such uncertainties and, therefore, to reduce the negative impact of these uncertainties on intended environmental performance.

2.1.2 | Strategic proactivity

Accounting information needs to be useful to support the implementation of organisational strategies at different levels. The more the accounting system is matched with organisational strategy, the more likely the objectives can be achieved (Langfield-Smith, 1997). In line with previous thoughts by Russell, Skalak, and Miller (1994) and Parker (1997; 2000), evidence from Qian et al. (2011) and Christ and Burritt (2013) suggests that proactive environmental strategy is likely to promote EMA use. Many studies making distinctions between reactive postures and proactive environmental stances agree that organisations with a higher degree of strategic proactivity are more likely to develop flexible and innovative environmental control and accounting information systems (Aragon-Correa, 1998; Dechant & Altman,

1994). For example, Roome (1992) pointed out that 'compliance' strategies are unlikely to result in internal environmental management changes because they are reactive, whereas a 'leading edge' proactive strategy facilitates deeper structural and management changes. Dechant and Altman (1994) observed that 'environmental leaders' are more likely to set a course for improving environmental performance and to have EMA in place as support. As Parker (2000) suggested, green strategies promote clear templates for more integrated costing system design. This could involve the use of full-cost accounting, total cost assessment and life-cycle approaches for environmental management (Russell et al., 1994). Osborn (2001) made a similar point for local government. His series of case studies evidenced that the attempt to commit to good governance and demonstrate strategic leadership in designing a sustainable community encourages local government to use EMA tools to identify full environmental impacts of its local services. The inference is that proactive local government is likely to be better prepared to enhance its leadership in providing environmental services and EMA information is likely to be seen as applicable and useful in support of its environmental leadership.

2.1.3 | Operational complexity

As the inherent role of EMA is to provide much needed information for managers to ensure 'effective and efficient control of the work process' (Scott & Meyer, 1983, p. 140), the nature of work activities is potentially highly relevant. If an organisation is delivering specialised, non-standard or differentiated services, it is more likely to employ complex technologies thereby requiring more flexible accounting systems to encourage responses (Chenhall, 2003). When the work or task is difficult and complex, standard and conventional accounting measures are considered incomplete. Previous studies found that high variety and complexity of work are associated with the processing of greater volumes of management information, greater care and deliberate use of non-conventional information and higher utilisation of a broader level of information (Chenhall, 2003; Daft & Macintosh, 1978). This positive link was supported in the context of developing EMA. Ball (2005) observed that when local government has to undertake complicated procedures and operations for its waste and landfill management, environmental managers are more willing to search actively for new environmental solutions within which EMA has a role to play. Qian et al. (2011) revealed that complex waste operation and service designs provide strong incentives for local government to seek internal and external EMA information and use this information to monitor services for ensuring efficiency and effectiveness. In this regard, EMA can be seen as being directly associated with the level of complexity of such operational demands.

2.2 | Institutional imperatives for EMA adoption

Previous studies also note that organisations are embedded in a larger institutional system beyond functional/technical rationality (DiMaggio & Powell, 1983). Bounded and assessed by norms, values and criteria in this social system, organisations are prone to construct stories about what the organisation should pursue and what it should not (Scott, 1995). If the social system is galvanised by a wide sense of environmental protection, environmental agenda and EMA approaches are likely to be pressed into use (Ball, 2005). This view stems from new institutional sociology which emphasises the role of social structure and power in transforming and greening organisations. While conformity with rules and values may become taken-for-granted, leading to isomorphism (Meyer & Rowan, 1977), more attention has been given to organisations' independent development and diverse reactions to institutional pressures (Greenwood, Hinings, & Whetten, 2014). The new emphasis is placed on practice diversity or heterogeneity as boundaries of perceived socially accepted rules and values may vary for different organisations resulting in diverse responses (Greenwood et al., 2014; Lounsbury, 2008). Information about socially accepted green behaviour can be transmitted through various channels and provides different levels of institutional pressures for change. Based on the discussion of coercive (regulatory), normative and mimetic (cognitive) institutions (DiMaggio & Powell, 1983; Scott, 1995), environmental regulatory pressure, social community demand and cognitive pressure have each been argued in prior literature as important imperatives for EMA use.

2.2.1 | Environmental regulatory pressure

Regulatory pressures are often seen as the most powerful and widespread stimulus for improvements in environmental management (Baylis, Connell, & Flynn, 1998). Public sector organisations, such as local government, differ significantly from private companies in terms of their goals, perceptions of performance and management contexts. They are more likely to adopt changes and innovations required or encouraged by governmental regulations and policies, and reject those prohibited (DiMaggio & Powell, 1983). In recent years, there has been rapid development of environmental protection legislation and policies that encourage the collection and management of environmental information. Under the Australian *Environment Protection and Biodiversity Conservation Act 1999*, State of the Environment (SoE) reporting has to be prepared regularly at the national, state and territorial levels. Since 2006, the SoE report has dedicated a chapter to the role of local government in environmental management and quality information collection. Also, the NSESD highlights the importance of environmental data collection and the responsibilities for each level of government in establishing relevant data systems. Local government in some states and territories, such as NSW and Queensland, has legislative responsibility for SoE reporting and local government is required to apply the principles of the NSESD and link SoE outcomes to its environmental management plan, identification of environmental indicators and collection and management of environmental data (NSWDLG, 2000). Although no direct regulatory requirement is specified for EMA, it can be argued that regulations and policy guidelines on environmental protection may provide incentives for local government to introduce a suitable accounting foundation to identify and collect environmental information.

2.2.2 | Community expectation

Societal obligation and expectations have been viewed as encouraging business managers to pursue environmental improvements (Lee & Hutchison, 2005). As Boons, Baas, Bouma, Groene, and Blanch (2000) illustrated, pressures from society and the socially constructed 'image' of the natural environment can lead to innovative environmental changes and actions. Given its unique position and role, local government is sensitive to public scrutiny. The increase in public demand for environmentally benign activities is seen as driving local government to take account of environmental impacts when drawing up environmental spending plans (Bowerman & Hutchinson, 1998). For example, in Gandy's (1993) investigation of the development of recycling measures in UK local councils, public pressure was perceived as a more influential factor in local recycling policymaking than factors such as examples provided by other local councils or commitment of council administration. Ball and Craig (2010) found that the increased value the local community placed on better environmental management practices formed a significant driver for the city council investigated to search for sustainable waste recycling and reduction. In contrast, if there is a lack of a wider environmental movement in society, environmental problems are likely to be confined at a micro level with EMA ignored or marginalised (Ball, 2005). Local government in Australia is required to involve members of communities to monitor environmental changes over time when preparing local SoE reports and obtaining communities' approval for environmental initiatives, such as preparation of environmental impact statements for new landfills or significant extensions to existing landfills (NSWEPA, 1996; NSWDLG, 2000). As such, the normative setting is likely to be significant to their development of EMA.

2.2.3 | Cognitive pressure

Social processes limit organisational actions to be consistent with a set of legitimate rules or practices determined by the group of organisations that makes up an organisational field (Scott, 1995). When social behaviour is collectively internalised, member organisations in the field tend to comply in order not to stand out as being different. Bouma and van der Veen (2002) found that the allocation of environmental costs was influenced by the 'organisational field that creates a concept for capturing environmental costs in the mindset of management' (p. 286). Powell (2000) found that many environmental managers in local councils were not clear about the benefits of life-cycle methods for waste management, but they utilised these methods because they wanted to be seen as a 'member' of the leading competitor group, and as 'doing good things' instead of being laggards (p. 365). Member organisations are often those closely tied

to each other, being in the same industrial association, located in the same geographical area, or having similar profiles. For example, Knoke (1982) observed that the closer a focal municipal government is to those municipal governments that have adopted management reform, the more likely it will adopt the same reform. Wright (2002) revealed that the increasing number of regional waste and recycling management associations and incentive schemes in Australia (e.g. regional waste boards in NSW, regional waste-management incentive schemes in Queensland) have helped local government develop integrated waste-management plans and recycling logistics in a cooperative way. Such cooperation means advanced accounting tools for environmental management such as EMA are more likely to spread throughout member councils.

2.3 | Levels of EMA use for waste and recycling management

While EMA highlights the importance of tracing, managing and reporting 'full', 'total' or 'true' environmental cost and impact information, in practice its use is at different levels. According to the International Federation of Accountants (IFAC) (2005) and the frameworks of EMA presented by Burritt, Hahn, and Schaltegger (2002) and USEPA (1995), full EMA records different classes of information: (1) direct monetary and physical information about environmental activities and relevant material and energy flows; (2) indirect costs internal to an organisation but hidden in overheads or overlooked in future periods of operations; and (3) recognition of external environmental costs, impacts and opportunities that are outside the boundary of the organisation and not captured by conventional accounting.

Direct EMA emphasises physical procedures for identifying direct material and energy consumption, flows and final disposal, and monetary procedures for identifying direct costs, savings and revenues related to the activities that have a potential environmental impact (Bartolomeo et al., 2000; UNDSD, 2001). Physical measures of an organisation's environmental activities and material flows are non-monetary information often not identified in financial accounting systems. Although monetary EMA is sometimes consistent with monetary measures in conventional accounting, the overall emphasis of EMA is more on linking monetary measures and physical material and energy flows with operational processes in order to reveal environmentally induced costs and revenues (Strobel & Redmann, 2002).

An extension of direct EMA is to include indirect costs and impacts recorded separately from the associated physical processes, such as costs for administrative support, legal services and fines, education, reporting and auditing, and site cleanup (IFAC, 2005; USEPA, 1995). While these costs are indirectly associated with environmental activities, the amounts can be substantial. For example, USEPA (1997) noted that continuing and regular outlays for local community education and promotional activities account for most financial resources in local government environmental management. Epstein (1996) highlighted that substantial future costs could be incurred as a result of past 'failures', such as a lack of accountability for full life-span costs of a service. These costs are ignored in conventional ex-post accounting systems because they are indirectly related to the current or historical operation of a process.

A further expansion of EMA is the inclusion of external environmental information. While externalities go beyond the boundary of an organisation, unless internalised they can cause an uncompensated loss of welfare to others (Pearce & Turner, 1990). External environmental costs and impacts are potentially larger than direct and indirect combined (Schaltegger & Burritt, 2000). A key differentiating characteristic of EMA is that costs and impacts of external environmental damage for decision-making (e.g. residual air emissions from waste disposal, depletion of natural resources) are in principle required to be internalised by the decision unit that creates them (IFAC, 2005). Therefore, assessing externalities is regarded as an integral part of EMA.

As the level of EMA expands in scope, it is possible that difficulties in capturing and managing this information may increase (USEPA, 1995; Qian et al., 2011). However, the external visibility of this information could decrease, because no existing requirements for waste-management reporting specifically target the broader levels of EMA involved. With inadequate knowledge of hidden costs, life-cycle costs and externalities, communities and the general public may not be able to bring sufficient pressures to local government to manage the full spectrum of EMA

information. Qian et al. (2011) found that as EMA information becomes broader, there is a tendency for the level of EMA uptake to be lower. Their study further implied that a stronger incentive to assess and use more expansive EMA information may stem from a strategic leadership position. In addition, Ball (2005) found that when the local council investigated encountered critical waste disposal uncertainties, it spent more time looking for ways to address problems (e.g. negotiating for a new landfill, trying incineration, shipping waste to small distant sites, paying money for reserving rights on the landfill, etc.), and this created a need to look for broader solutions and necessary information support. This implies that functional demands of individual local governments are likely to exert stronger influences on the adoption of a wider level of EMA than institutional imperatives. The following two hypotheses are therefore generated:

H1: The level of local government use of EMA for waste and recycling services depends upon the strength of functional (environmental uncertainty, strategic proactivity and operational complexity) and institutional (regulatory pressure, community expectation and cognitive pressure) imperatives.

H2: The level of local government use of more expansive EMA for waste and recycling services is driven more by functional than institutional imperatives.

3 | RESEARCH DESIGN AND METHOD

A mail survey was used to collect data from local councils in NSW, Australia. The scale of the empirical data collected in the survey allowed the mapping of different levels of EMA information with different drivers. NSW as the most populous state in Australia has the highest number of local councils and was the first state to introduce environmental legislation requiring local governments to meet the objectives and principles of the NSESD (NSWDEC, 2003). It has the highest total expenditure on waste management and the widest level of waste and recycling data collection and availability (ABS, 2004; 2011). NSW has identified the need to cover the cost of environmental externalities in waste disposal and introduced true cost pricing and levies on waste disposal twenty years ago (NSWEPA, 1996). These considerations support the decision to examine drivers of EMA in this state.

The survey instrument was pretested in a pilot study of 11 different sizes and types of NSW local councils. These pre-tests were carried out through interviews with managers responsible for waste and recycling services and helped develop and adjust survey questions. The final survey was sent to the remaining 141 councils. A total of 122 responses were received. However, five responses omitted considerable data and were thus removed. This resulted in 117 usable responses – an 83% response rate. Three main reasons may have led to this high response rate. The foremost reason is support obtained from the *Department of Environment and Climate Change NSW* and *Local Government and Shires Association of NSW*. Their endorsement provided a strong incentive for local government to participate. Second, a list of names and contacts of potential participants (environmental managers) in each council was obtained with the cooperation of the *Department of Environment and Climate Change NSW*, which enabled the surveys to be addressed to specific persons. Third, as recommended by Dillman (2000), each participant was sent a letter of project introduction, a questionnaire, and a reply-paid, pre-addressed envelope. Participants were assured of data confidence with no individuals being identifiable in any publications. Follow-up reminders and replacement questionnaires were sent *three* times to encourage response.

Within the group of 117 participating councils, 74 were classified as urban (with a population of 20,000 and over, or a density of over 30 persons per square kilometre) and the remainder as rural. Although there was a slightly lower response rate from rural councils, the high overall rate reduced the possibility of a non-response bias. To confirm this, the variable means from early and late respondents were statistically compared using the *T* test and the Mann–Whitney *U* test. There was no systematic difference in results. In addition, eight responses omitted answers to questions (12 values in total were omitted). The *full information maximum likelihood* method was applied to impute values for all missing observations in the dataset.

3.1 | Measurement of variables

3.1.1 | Dependent variable

The dependent variable represents different levels of EMA use. It was measured using an index of information items adapted from ACT Government (2001) and Qian et al. (2011), NSWEPA (1996), USEPA (1997). The index contained 17 items of *direct* monetary and physical flow information, nine items of *indirect* internal costs and impacts, and eight items of *external* costs and impacts. The items of direct *physical* flow information included quantity information of total waste collection, waste to landfills, total and different recyclables collected and recovered, contamination rate of recyclables and total green waste collected. Direct *monetary* flow information involved total and unit (per tonne or per household) costs associated with physical flows in waste management, such as waste collection costs, recyclable collection and sorting costs, green waste collection and processing costs and so on. *Indirect* information is hidden in overheads and shared by different physical flows. This included items such as waste reporting and auditing costs, avoided landfill disposal costs, waste education and outreach costs, anticipated or expected costs in relation to regulatory changes, new landfill sites, site and facility replacement, closure or post-closure care, rehabilitation and remediation activities and so on. *External* EMA covers environmental benefits and impacts of waste services. Examples included costs associated with landfill leachate treatment for protection of ground water, economic value of resources being buried as waste in landfill, costs related to the loss of amenity because of waste disposal, greenhouse effects contributed by waste streams and so on. For each information item listed in the survey questionnaire, respondents were asked to specify the extent their councils used this information for waste and recycling management (from 5 = fully, to 1 = never). The average scores calculated for each level of EMA indicate the extent to which the information used by local councils is close to '*full*' EMA information as classified.[1]

3.1.2 | Independent variables

Independent variables were mainly measured using five-point scales to distinguish the extent to which the respondent agreed with a statement or considered it most appropriate as a description of the position of that council. Factor analysis and reliability tests were implemented to ensure the construct validity of measurements. Table 1 presents the factor analysis results.

As shown in Table 1, *environmental uncertainty* was examined through main uncertainties faced by local councils such as changes in waste disposal costs or the costs of providing waste service. Respondents were asked to indicate the extent to which they agreed that the possibilities of the listed changes in the near future were low (5 = strongly agree, 1 = strongly disagree). While the items loaded onto one factor, the item addressing the recyclables market failed to load within the acceptable limits (0.4) and its inter-total correlation was less than 0.3. This item was excluded from further analysis and the Cronbach α was improved to 0.742.

The measurement of *strategic proactivity* was developed based on the environmental strategy studies of Roome (1992) and Aragon-Correa (1998). Respondents were asked to indicate how important the listed strategic goals were in relation to their waste-management activities. The scales used for this question ranged from '5' (very important) to '1' (not important). Factor analysis indicated one factor with a high Cronbach α of 0.839.

Environmental regulatory pressure may come from federal and/or state waste-management legislation and policies. The measurement of regulatory pressure combined the regulatory and policy developments at different government levels. As there was no regulatory requirement directly related to EMA adoption, the measurement items were set within the broader regulatory context for environmental and waste management. Respondents were asked about the perceived importance of listed regulatory items (5 = very important, 1 = not important). The factor analysis revealed one factor with a Cronbach α of 0.814.

Community expectation was measured by five items reflecting the community's expectation, attitude or interest in various waste and recycling activities, projects and performance. Respondents were asked to indicate the extent to which they perceived the local community expected or was interested in listed actions or issues. The scales for this question ranged from '5' (very interested) to '1' (not interested) and a Cronbach α of 0.823 ensured the internal consistency of measurement factors.

TABLE 1 Factor analysis of independent variables

Variables	Items	Loading	Explained variance
Environmental uncertainty	Change in waste disposal costs	0.681	Cronbach $\alpha = 0.742$ Variance explained = 49.650%
	Change in the cost of providing waste service	0.841	
	Change in the cost of establishing new landfills in the region	0.742	
	Change in the landfill space and availability in the region	0.614	
	Change in landfill as the dominant outlet for waste disposal in the region	0.588	
	Change in market stability for recyclables (removed)	0.360	
Strategic proactivity	To achieve compliance with environmental legislation relating to waste issues	0.710	Cronbach $\alpha = 0.839$ Variance explained = 62.864%
	To develop effective waste solutions for the benefit of the local community	0.844	
	To achieve both environmental and financial excellence in waste management	0.817	
	To achieve State leadership in sustainable waste management	0.796	
Environmental regulatory pressure	The waste reduction target set in the Australian NSESD	0.721	Cronbach $\alpha = 0.814$ Variance explained = 57.011%
	The State's target of 66% resource recovery	0.757	
	The waste levy imposed to fund waste minimisation	0.799	
	The annual State of the environment reporting requirement	0.771	
	The waste performance reporting requirement	0.711	
	Licence requirements for landfill construction	0.661	
Community environmental expectation	Participate in waste reduction and recycling programs	0.813	Cronbach $\alpha = 0.823$ Variance explained = 60.851%
	Improve environmental performance of waste management	0.775	
	Report to the community about waste performance	0.741	
	Interest in the level of waste-management services	0.819	
	Participate in the council's waste-management project decision-making	0.728	
Cognitive pressure in the organisational field	From neighbouring councils	0.795	Cronbach $\alpha = 0.818$ Variance explained = 59.737%
	From councils that are similar in type (e.g. urban, regional, rural)	0.884	
	From councils that are similar in size (e.g. very large, medium, small)	0.783	
	From member councils in regional local council association(s)	0.602	

Cognitive pressure was measured using perceptions of several local council contexts developed in Knoke (1982) and Wright (2002), Powell (2000). Respondents were asked to indicate how they viewed waste-management performance in each of the other types of council relative to their own, such as neighbouring councils or member councils in regional council associations[2]. The scales spread from '5' (excellent) to '1' (poor) and items all loaded onto one factor with a Cronbach α of 0.818.

For measuring *operational complexity*, an index of 16 waste and recycling operation and service design items was used, mainly compiled from operational studies in the field of waste and recycling management (e.g. Domina & Koch, 2002; Noehammer & Byer, 1997; Powell, 2000). The index included the provision of kerbside collection services, different waste and recycling collection designs (such as container collection, frequency of collection, targeted materials, etc.), operations of material recovery facilities, and landfill operations. Each respondent was asked to indicate whether the council provided such services or operations. If the participant answered 'yes', a '1' was noted; otherwise, a '0' was recorded. The average score was used to represent the level of operational complexity for individual councils.

In addition, *control variables* for council *type* and *size* were included. Based on previous definitions of urban and rural councils, we assigned '1' to urban and '0' to rural councils. The measurement of *size* was based on population in individual urban/rural council areas as indicated by NSW Department of Local Government (NSWDLG) (2004). A council was coded as 'large' if its population was more than 70,000 in urban areas or more than 5,000 in rural areas. Otherwise, it was coded as 'small'.

4 | RESULTS

4.1 | Descriptive results

Table 2 reports the average levels of EMA use for waste and recycling services.

Based on a scale of 5 (fully used) to 1 (never used), the descriptive statistics reveal average scores of 3.34, 3.01 and 2.35 for *direct monetary and physical flows* (direct EMA), *indirect internal costs and impacts* (indirect EMA), and *external environmental costs and impacts* (external EMA), respectively. These statistics suggest that the level of EMA use for waste and recycling services is generally moderate, but the broader the level of EMA, the less likely on average that the information is identified and used. The average level of EMA use in urban councils (3.78 for direct use; 3.22 indirect use; 2.64 external use) is higher than in rural councils (2.75; 2.71; 1.98), although the differences in the use of indirect and external EMA are rather smaller than direct EMA use. For direct EMA, most quantity and cost information for total recyclables and waste in terms of collection, disposal and recovery activities has been well captured, while segregated figures relating to different recyclables are used significantly less. Of interest is that although the minimum level of

TABLE 2 Descriptive statistics on EMA use[3]

Different levels of EMA information	Type of local council	No. of local council	Average use level[a]	Standard deviation	Min. use level	MAX. use level
Direct monetary and physical flows	All	117	3.34	0.90	1.47	4.89
	Urban	67	3.78	0.67	1.84	4.89
	Rural	50	2.75	0.83	1.47	4.47
Indirect internal costs and impacts	All	117	3.01	0.84	1.11	5.00
	Urban	67	3.22	0.81	1.33	4.89
	Rural	50	2.71	0.80	1.11	5.00
External environmental costs and impacts	All	117	2.35	0.83	1.00	4.13
	Urban	67	2.64	0.77	1.00	4.13
	Rural	50	1.98	0.75	1.00	3.63

[a]The scales of perceptions are as follows: 5 = fully used; 4 = largely used; 3 = used to some extent; 2 = used very little and 1 = never used.

TABLE 3 Correlations and descriptive statistics

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) Direct monetary and physical flows	1.00								
(2) Indirect internal costs and impacts	0.436	1.00							
(3) External costs and impacts	0.523	0.646	1.00						
(4) Environmental uncertainty	0.456	0.245	0.314	1.00					
(5) Strategic proactivity	0.635	0.610	0.595	0.309	1.00				
(6) Operational complexity	0.697	0.544	0.525	0.412	0.575	1.00			
(7) Environmental regulatory pressure	0.482	0.339	0.441	0.255	0.519	0.384	1.00		
(8) Community expectation	0.470	0.285	0.402	0.278	0.484	0.352	0.400	1.00	
(9) Cognitive pressure	0.393	0.323	0.351	0.260	0.383	0.362	0.317	0.376	1.00
Mean				3.02	3.93	0.55	3.33	3.48	3.27
S.D.				0.49	0.64	0.27	0.75	0.60	0.53
Min.				1.57	1.75	0.00	1.00	1.71	1.25
Max.				4.00	5.00	0.93	4.83	4.71	4.50
$N = 117$									

indirect EMA use in rural councils is 1.11, lower than that in urban councils (which is 1.33), the maximum achieves a full score of 5 in rural councils, higher than that in urban councils (which is 4.89).

Table 3 presents descriptive statistics for independent variables and the correlations between variables using Spearman's rho correlation coefficients. The results show that most variable means are at the middle of the theoretical range of 1–5 or 0–1, except the mean for *strategic proactivity*, which reaches 3.93. Three urban councils and one rural council recorded a maximum value of 5 for strategic proactivity, reflecting their commitments towards proactive environmental strategies and sustainability leadership. Table 3 also reveals the dependent and independent variables are correlated in the expected directions. Most correlations between independent variables are moderate, with correlation coefficients between 0.3 and 0.5; none of them is higher than 0.7. The variance inflation factor (VIF) and condition indices (CI) indicate that multicollinearity is not a concern. All VIFs are below 2.0. The maximum CI is 13.64, which is well below the potential problem level of 30.

4.2 | Hypotheses test results

Table 4 presents the results of three empirical models used to test the hypotheses[4]. Model 1 evaluates the impact of functional and institutional imperatives on the use of direct EMA information. The *F*-statistic of 26.466 ($p = 0.000$) and adjusted R^2 of 63.7% indicate sufficient model fit. The results show that four of the independent variables are statistically significant. All three functional variables are significant in Model 1. Operational complexity and strategic proactivity are both significant at the 0.01 level ($p = 0.000$ and $p = 0.004$, respectively), with environmental uncertainty being moderately significant ($p = 0.069$). These results confirm that the use of direct EMA information is highly associated with the level of complexity in operational processes, the level of proactivity in prioritising environmental strategy and the level of uncertainty in organisational environments for achieving functional outcomes, i.e. the efficiency and effectiveness of processes in waste and recycling management. In contrast, community's environmental expectations ($p = 0.022$) is the only institutional variable significantly associated with the use of direct physical and monetary flow information. Environmental regulation ($p = 0.146$) and cognitive pressure ($p = 0.275$) do not seem to play an important part in motivating local government to identify and use direct EMA information. The results of Model 1 also show that direct EMA used in urban and rural councils is statistically significant. With the positive result in relation to council type ($p = 0.005$), urban councils have a significantly higher level of direct EMA use than their rural counterparts. Council size, however, shows no significant effect.

TABLE 4 Regressions on levels of EMA use

	Model 1		Model 2		Model 3	
	Direct monetary and physical flows		Indirect internal costs and impacts		External costs and impacts	
Variable	Coefficient	*p* Value[a]	Coefficient	*p* Value	Coefficient	*p* Value
(Constant)	−1.117	0.014**	−0.324	0.566	−1.091	0.060*
Environmental uncertainty	0.109	0.069*	0.096	0.203	0.055	0.477
Strategic proactivity	0.233	0.004***	0.481	0.000***	0.333	0.002***
Operational complexity	0.350	0.000***	0.293	0.001***	0.229	0.014**
Environmental regulatory pressure	0.099	0.146	0.099	0.252	0.146	0.102
Community expectation	0.161	0.022**	−0.007	0.940	0.082	0.368
Cognitive pressure	0.071	0.275	0.056	0.498	0.049	0.566
Type	0.196	0.005***	−0.167	0.057*	0.016	0.859
Size	0.085	0.152	−0.110	0.146	−0.012	0.881
F	26.466		11.428		9.892	
Sig.	.000***		0.000***		0.000***	
R^2-adjusted	0.637		0.418		0.380	
N	117		117		117	

[a]One-tailed *p* values.
***Significant at the 0.01 level.
**Significant at the 0.05 level.
*Significant at the 0.10 level.

Model 2 is the regression on accounting for indirect internal costs and impacts. Although the adjusted R^2 (0.418) is lower when compared with Model 1, the model fit is considered satisfactory as the regression still explains over 40% of the total variance of the dependent variable. The evaluation of Model 2 indicates that two of the independent variables are strongly associated with indirect EMA use. These include operational complexity ($p = 0.001$) and strategic proactivity ($p = 0.000$), both of which are important explanatory variables in Model 1. However, none of the three institutional variables, including regulatory drive ($p = 0.252$), cognitive pressure ($p = 0.498$) and community expectation ($p = 0.940$) are significant. Similarly, environmental uncertainty ($p = 0.203$) which has a significant effect on the use of direct EMA in Model 1, is not significant in explaining the use of indirect EMA. The type of local government ($p = 0.057$) exhibits a moderate negative relationship ($\alpha = -0.167$), suggesting rural councils use more indirect internal information than urban councils. Model 3 is the regression on the use of external EMA, the most expansive information. Its model fit (adjusted $R^2 = 0.380$) is similar to Model 2, as are the results. Operational complexity ($p = 0.014$) and strategic proactivity ($p = 0.002$) are the two variables significantly influencing the use of external EMA. Other variables, including the type and size of local councils, are not significant.

Considering the results of the three models together, H1 is partially supported and H2 is fully supported. The positive role of functional demands is confirmed but the effect of institutional pressures is limited to direct EMA information collection. Compared with social institutional imperatives, functional imperatives are seen as more effective drivers for EMA use in waste and recycling management.

5 | DISCUSSION

5.1 | Practical implications from different effects of variables

The results clearly show that all levels of EMA are significantly impacted by strategic proactivity and operational complexity, i.e. two functional imperatives. They have strongly motivated the collection and dissemination of the broader

level of EMA. Previous research has highlighted the difficulty in capturing and utilising hidden as well as external EMA (Burritt et al., 2002). The current results suggest that future policy needs to focus on assisting local government to develop measurement tools to cope with increasingly complex environmental service delivery and in developing more active strategic environmental posture beyond a mere focus on compliance.

Community expectation and environmental uncertainty are two variables significantly associated with the use of direct EMA (Model 1), but they lose explanatory power in the context of indirect internal and external costs and impacts (Models 2 and 3). Although there seems to have been increasing community pressure for more sustainable waste services, local councils tend to respond with increasing collection of direct EMA information. Results show that the high level of community expectations does not provide further incentive for local government to take fuller EMA information into account. The imperative for bringing indirect internal and external costs and impacts to local community members has either not been voiced by the local community or not been recognised by local government. The greater the awareness of local community gains, the greater may be the call for transparency of EMA data, and the higher the likelihood that such an imperative is acknowledged by local government.

Environmental uncertainty imposes an immediate threat to waste and recycling performance, such as the efficiency of waste disposal and the viability of recycling services. Results support the argument that direct EMA is useful to help cope with such a threat and to reduce uncertainty. Nevertheless, environmental uncertainty does not trigger a thorough review of the sustainability of waste and recycling management in the longer term as it does not provide a strong enough incentive for gathering a broader spectrum of EMA information. This raises further questions as to whether the current environmental threat is a real threat or whether it has been perceived as a real threat by local authorities.

The results also indicate that the variations in environmental regulation and cognitive pressure are not significantly associated with the level of EMA development. In spite of current reporting and licencing requirements, results suggest that the adoption of EMA in local government is predominantly a voluntary activity. Although the NSESD in Australia stresses the importance of full-cost accounting and life-cycle analysis for waste and recycling management (AESDSC, 1992), the inadequacy of specific policies and guidelines to support quality waste information management discourages uptake. In particular, the insignificant result for cognitive pressure provides a contrast with previous literature. A presumption of the diffusion of environmentally responsible accounting practices in a specific organisational field is that information about such practices has been well received by member organisations in that field (Powell, 2000). The cognitive mechanism works when member organisations can easily observe EMA practices and developments and they can adopt similar practices which align with their reputation, image or profiles (Greenwood et al., 2014). At present, information about EMA adoption in local government is limited in scope. If the extent to which a practice or behaviour has diffused in an organisational field predicts the likelihood of conformity by member organisations, the lack of publicity about successful implementation and insufficient organisational interaction and information flows about EMA practice and development among local councils might explain the insignificant result. This is the policy area in greatest need of attention.

5.2 | Theoretical implications for different levels of EMA use

The finding supporting H2 indicates that local government is subject to stronger functional than institutional imperatives in developing wider levels of EMA use. Strategic proactivity and operational complexity provide significant incentives for the development of more difficult and underutilised parts of EMA. Institutional theory partially explains the development of EMA in local government. Only community expectation is a significant contributor, but at the narrower level rather than the broader and more expansive levels. In this regard, local government use of EMA for its waste and recycling services can be viewed more as an adaptive activity to cope with organisational contextual challenges and dynamics, resting on functional imperatives to achieve efficiency and targeted performance, than as a larger social system related activity, resting on institutional imperatives to achieve social acceptance.

This result may be explained in two ways. First, the weaker role of institutional pressures implies that EMA development for waste and recycling services is still in an early stage. As Tolbert and Zucker (1983) note, early adopters

of a new framework are driven more by the desire to improve internal processes, as direct benefits can be gained, but when acceptance starts to diffuse, a threshold is reached beyond which adoption provides social legitimacy rather than improved technical performance. To accelerate the development of EMA in this critical area of waste and recycling services, mechanisms need to be reviewed or redesigned to facilitate understanding of EMA as a key component of local government environmental management and it being accepted and mainstreamed in all relevant social structures, particularly regulatory authorities, communities and cooperative associations of councils.

Second, the stronger influence of functional imperatives for more complex EMA use may align with the new performance output/outcome public management philosophy promoted in governmental reforms over the past few decades (Guthrie, 1993; Ryan, Stanley, & Nelson, 2002). These reforms have driven public sector organizations such as local government to pursue output/outcome performance orientated public service delivery and management (Broadbent & Guthrie, 2008; Burritt & Welch, 1997; Guthrie, Parker, & English, 2003). EMA may be seen as one of the useful frameworks to help achieve or maintain operational efficiency, such as saving waste disposal and recycling service costs, streamlining waste services and operations, and meeting targets and goals. Given the results, local councils will need to support examination of environmental matters that challenge basic values and assumptions and mitigate against necessary long-term thinking implied by movement towards sustainability (Broadbent & Guthrie, 2008; Burritt & Welch, 1997). However, as Guthrie (1993, p. 103) indicates, one of the main effects of public sector organisations adopting corporatised and privatised activities is a growing incompatibility between implementation of 'new' corporate forms and the long-term social goals of the public sector. The results bear out such a view and may partly explain the current low take up of more expansive EMA, as this demands more long-term thinking and commitment by local government, a critical element of the EMA concept. This highlights the issue and risk of adopting a short-term focus on operational efficiency aspects of EMA (more narrowly focussed direct EMA information) rather than long-term tools (fuller spectrum of EMA information use) to support examination of environmental problems in waste and recycling management, As such, current technical/efficiency orientated policy may need to be reconsidered in New Public Management context if the social and institutional side is to be brought to the fore once again.

6 | CONCLUSIONS

This study investigated the nature and drivers of EMA in local government. Two contextual perspectives, functional and institutional imperatives, were discussed and analysed as predictors of EMA development in the context of waste and recycling services. We conjectured that although the use of EMA in local government is likely to be driven by both functional and institutional imperatives because of the voluntary nature of EMA and the lack of enforcement for collecting and using more expansive EMA in local government, institutional imperatives would be of lesser importance as drivers for EMA use.

The survey results indicated a moderate adoption of EMA for waste and recycling services in local government examined. When the level of environmental information was broadened, lower take up of EMA was found. This result suggests that the current focus of EMA in local government waste and recycling management remains at a narrow level. Hence, future policy needs to be directed towards establishing a 'fuller account' of internal and external environmental costs and impacts. The study also found that the use of direct EMA was driven by all functional variables examined: environmental uncertainty, strategic proactivity and operational complexity. The latter two were also significant drivers for more expansive EMA use. In contrast, although the use of direct EMA was positively related to community environmental expectations, this driver was not significantly related to accounting for broader environmental costs and impacts. Environmental regulations and cognitive pressure were not perceived to be effective for any level of EMA use in waste and recycling management.

The stronger influence of functional imperatives implies that current development of EMA for waste and recycling management is driven more by technical demands which help address immediate threats to efficiency and improvement in management performance targets, rather than social movements and demands. This suggests that future policy should focus more on helping local councils develop performance measurement tools to cope with increasingly

complex environmental service delivery and uncertain service demands, particularly for urban councils. While urban councils make significantly greater use of direct EMA information than rural councils, their use of broader EMA information is lower. Moreover, the relatively weaker role of institutional imperatives may warrant a review of social mechanisms in understanding EMA, especially the broader spectrum of EMA. Although regulatory enforcement and community empowerment exist, they have not been translated into the imperative for more expansive EMA use. Regulators, local communities and regional council cooperative associations may need to be made aware of the benefits of tapping into broader EMA so that their weight can fall behind further EMA development.

The paper is not without limitations. First, as common with such studies it is possible that some perceptual responses to the inquiries in this research may be partial especially to environmentally sensitive questions. This response bias may influence the results. Second, as data access was limited to NSW in Australia, caution needs to be taken not to over-generalise results. Nevertheless, it could be argued that with the introduction of New Public Management the basic nature of local government in Australia is similar in different states and territories and the underlying principles of local government could be common across many developed countries.

Future research could aim to investigate two further issues. First is examination of the reasons for the low contribution from regulatory and cognitive pressures. Further exploration of such reasons could help with the redesign of these mechanisms to promote the introduction of and secure the benefits from EMA. Second, because of the New Public Management reform, public services are frequently assessed on functional efficiency and financial accountability rather than service quality and community responsibility, and consequently additional smaller players (mainly private enterprises) have started to get involved with the provision of public services (Broadbent & Guthrie, 2008). Research is needed into understanding the extent to which this change may affect the development of EMA and the balance between functional and institutional imperatives for local government environmental management.

ACKNOWLEDGEMENTS

The authors would like to thank the local government organisations providing information for this study. Special thanks to Professor Stefan Schaltegger, Professor James Guthrie, Professor Richard Laughlin, Professor Jane Broadbent and Professor Lee Parker for their continuous encouragement and valuable comments and suggestions on earlier versions of this paper.

NOTES

[1] Detailed information regarding the survey instrument and the diversity and characteristics of the variables tested is available from the authors upon request.

[2] For local councils that did not participate in any regional association and did not answer the question, their observations were temporarily eliminated from the factor analysis to avoid bias.

[3] As the descriptive results present no substantial difference between small and large councils at each level of EMA use irrespective of the type of councils, *size* of councils was not tabulated in Table 2.

[4] Before using regression models to evaluate the hypotheses, measures of skewness and kurtosis of the variable distributions and the Kolmogorov-Smirnov (K-S) test were undertaken. Four variables were noted for non-normality. We attempted several transformation methods and used the log transformation method as it best improved the distribution for normality.

REFERENCES

ABS (2004). *Environment Expenditure: Local Government, Australia 2002–2003*. Australian Bureau of Statistics (ABS) Catalogue No.: 4611.4610. Retrieved from https://www.abs.gov.au/ausstats/abs@.nsf/mf/4611.0

ABS (2011). *Waste Management Services, Australia, 2009–10*. Australian Bureau of Statistics (ABS) Catalogue No.: 8698.0. Retrieved from https://www.abs.gov.au/ausstats/abs@.nsf/mf/8698.0

ACT Government (2001). *The actual costs of waste disposal in the ACT*. Canberra, Australia: A Study by RPM Pty Ltd, Kenney Lin & Associates and Energy Strategies Pty Ltd for ACT Waste Department of Urban Services.

Aragon-Correa, J. (1998). Strategic proactivity and firm approach to the natural environment. *Academy of Management Journal*, *41*(5), 556–567. https://doi.org/10.2307/256942

AESDSC (1992). *National strategy for ecologically sustainable development*. Australian Ecologically Sustainable Development Steering Committee (AESDSC), ISBN 0 644 27253 27258.

Ball, A. (2005). Environmental accounting and change in UK local government. *Accounting, Auditing & Accountability Journal*, *18*(3), 346–373. https://doi.org/10.1108/09513570510600738

Ball, A., & Craig, R. (2010). Using neo-institutionalism to advance social and environmental accounting. *Critical Perspectives on Accounting*, *21*(4), 283–293. https://doi.org/10.1016/j.cpa.2009.11.006

Bartolomeo, M., Bennett, M., Bouma, J., Heydkamp, P., James, P., & Wolters, T. (2000). EMA in Europe: Current practice and future potential'. *The European Accounting Review*, *9*(1), 31–52. https://doi.org/10.1080/096381800407932

Baylis, R., Connell, L., & Flynn, A. (1998). Company size, environmental regulation and ecological modernisation: Further analysis at the level of the firm. *Business Strategy and the Environment*, *7*, 285–296. https://doi.org/10.1002/(SICI)1099-0836(199811)7:5<285::AID-BSE166>3.0.CO;2-U

Boons, F., Baas, L., Bouma, J., Groene, A., & Blanch, K. (2000). *The changing nature of business: Institutionalisation of green organisational routines in the Netherlands 1986–1995*. Utrecht, The Netherlands: International Books.

Bouma, J., & van der Veen, M. (2002). Wanted: A theory for EMA. In M. Bennett, J. Bouma, & T. Wolters (Eds.), *EMA: Informational and Institutional Developments* (pp. 279–290). Kluwer Academic Publishers.

Bowerman, M., & Hutchinson, F. (1998). The role of local authority accountants in environmental decision-making. *Financial Accountability & Management*, *14*(4), 299–317. https://doi.org/10.1111/1468-0408.00067

Broadbent, J., & Guthrie, J. (2008). Public sector to public services: 20 years of 'contextual' accounting research. *Accounting, Auditing & Accountability Journal*, *21*(2), 129–169. https://doi.org/10.1108/09513570810854383

Burritt, R., Hahn, T., & Schaltegger, S. (2002). Towards a comprehensive framework for EMA—Links between business actors and EMA tools. *Australian Accounting Review*, *12*(2), 39–50. https://doi.org/10.1111/j.1835-2561.2002.tb00202.x

Burritt, R., & Welch, S. (1997). Accountability for environmental performance of the Australian Commonwealth Public Sector. *Accounting, Auditing & Accountability Journal*, *10*(4), 532–561. https://doi.org/10.1108/09513579710367494

Chenhall, R. (2003). Management control systems design within its organisational context: Findings from contingency-based research and directions for the future. *Accounting, Organisations and Society*, *28*(2–3), 127–168. https://doi.org/10.1016/S0361-3682(01)00027-7

Chenhall, R., & Langfield-Smith, K. (1998). The relationship between strategic priorities, management techniques and management accounting: An empirical investigation using a systems approach. *Accounting, Organisations and Society*, *23*(3), 243–264. https://doi.org/10.1016/S0361-3682(97)00024-X

Chenhall, R., & Morris, D. (1986). The Impact of Structure, Environment, and Interdependence on the Perceived Usefulness of Management Accounting Systems. *The Accounting Review*, *61*(1), 16–35. Retrieved from https://www.jstor.org/stable/247520

Christ, K., & Burritt, R. (2013). EMA: The significance of contingent variables for adoption. *Journal of Cleaner Production*, *41*, 163–173. https://doi.org/10.1016/j.jclepro.2012.10.007

Daft, R., & MacIntosh, N. (1978). A new approach to design and use of management information. *California Management Review*, *26*, 82–92.

Dechant, K., & Altman, B. (1994). Environmental leadership: From compliance to competitive advantage. *Academy of Management Executive*, *8*(3), 7–26. Retrieved from https://www.jstor.org/stable/4165201

Dillman, D. (2000). *Mail and internet surveys: The tailored design method* (2nd ed.). New York: John Wiley & Sons, Inc.

DiMaggio, P., & Powell, W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organisational fields. *American Sociological Review*, *48*(2), 147–160. Retrieved from https://www.jstor.org/stable/2095101

Domina, T., & Koch, K. (2002). Convenience and frequency of recycling: Implications for including textiles in curbside recycling programs. *Environment and Behaviour*, *34*(2), 216–238. https://doi.org/10.1177/0013916502342004

Epstein, M. (1996). Improving environmental management with full environmental cost accounting. *Environmental Quality Management*, *6*(1), 11–22. https://doi.org/10.1002/tqem.3310060104

European Commission (2009). *Life cycle thinking and assessment for waste management*, *European commission*. Directorate-General for the Environment and Joint Research Centre Publication.

Ewusi-Mensach, K. (1981). The external organisation environment and its impact on management information systems. *Accounting, Organizations and Society*, *6*, 301–316. https://doi.org/10.1016/0361-3682(81)90010-6

Ferreira, A., Moulang, C., & Hendro, B. (2010). EMA and Innovation: An exploratory analysis. *Accounting, Auditing & Accountability Journal*, *23*(7), 920–948. https://doi.org/10.1108/09513571011080180

Frost, G., & Seamer, M. (2002). Adoption of environmental reporting and management practices: An analysis of New South Wales public sector entities. *Financial Accountability & Management*, *18*(2), 103–127. https://doi.org/10.1111/1468-0408.00147

Gandy, M. (1993). *Recycling and waste: An exploration of contemporary environmental policy* (Avebury studies in green research). Aldershot: Ashgate Publishing.

Greenwood, R., Hinings, C., & Whetten, D. (2014). Rethinking institutions and organizations. *Journal of Management Studies*, *51*, 1206–1220. https://doi.org/10.1111/joms.12070

Guthrie, J. (1993). Australian public business enterprises: Analysis of changing accounting, auditing and accountability regimes. *Financial Accountability & Management*, *9*(2), 101–114. https://doi.org/10.1111/j.1468-0408.1993.tb00368.x

Guthrie, J., Parker, L., & English, L. (2003). A review of new public financial management change in Australia. *Australian Accounting Review*, *13*(2), 3–9. https://doi.org/10.1111/j.1835-2561.2003.tb00393.x

International Federation of Accountants (IFAC) (2005). *International guidance document on EMA*. New York: IFAC.

Knoke, D. (1982). The Spread of Municipal Reform: Temporal, Spatial, and Social Dynamics. *The American Journal of Sociology*, *87*(6), 1314–1339. https://doi.org/10.1086/227595

Lal, M., & Hassel, L. (1998). The joint impact of environmental uncertainty and tolerance of ambiguity on top managers' perceptions of the usefulness of non-conventional management accounting information. *Scandinavian Journal of Management*, *14*(3), 259–271. https://doi.org/10.1016/S0956-5221(98)80010-9

Langfield-Smith, K. (1997). Management control systems and strategy: A critical review. *Accounting, Organisations and Society*, *22*(2), 207–232. https://doi.org/10.1016/S0361-3682(95)00040-2

Lee, T., & Hutchison, P. (2005). The decision to disclose environmental information: A research review and agenda. *Advances in Accounting*, *21*, 83–111. https://doi.org/10.1016/S0882-6110(05)21004-0

Lewis, L. (2000). Environmental audits in local government: A useful means to progress in sustainable development. *Accounting Forum*, *24*(3), 296–318.

Lounsbury, M. (2008). Institutional rationality and practice variation: New directions in the institutional analysis of practice. *Accounting, Organizations and Society*, *33*(4–5), 349–361. https://doi.org/10.1016/j.aos.2007.04.001

Meyer, J., & Rowan, B. (1977). Institutionalised organisations: Formal structure as myth and ceremony. *American Journal of Sociology*, *83*(2), 340–363. Retrieved from https://www.jstor.org/stable/2778293

Noehammer, H., & Byer, P. (1997). Effect of design variables on participation in residential curbside recycling programs. *Waste Management & Research*, *15*, 407–427. https://doi.org/10.1006/wmre.1996.0096

NSWDEC (2003). *Consultation paper: Local government action plan—Contributing to waste reduction and resource recovery in NSW*. Australia: NSW Department of Environment and Conservation (NSWDEC).

NSWDLG (2000). *Environmental guidelines: State of the environment reporting by local government—Promoting ecologically sustainable development*. Australia: NSW Department of Local Government (NSWDLG).

NSWDLG (2004). *Structural reform of local government in New South Wales*. Australia: NSW Department of Local Government (NSWDLG).

NSWEPA (1996). *Environmental guidelines: Solid Waste Landfills* Australia: NSW Environmental Protection Authority (NSWEPA).

Osborn, D. (2001). *Looking For opportunities in EMA: Experiences among four Australian Local Governments*. Australia: Principal, Green Measures.

Parker, L. (1997). Accounting for environmental strategy: Cost management, control and performance evaluation. *Asia-Pacific Journal of Accounting*, *4*(2), 145–173. https://doi.org/10.1080/10293574.1997.10510518

Parker, L. (2000). Green strategy costing: Early days. *Australian Accounting Review*, *10*(1), 46–56. https://doi.org/10.1111/j.1835-2561.2000.tb00054.x

Pearce, D., & Turner, R. (1990). *Economics of natural resources and the environment*. Baltimore: Johns Hopkins University Press.

Powell, J. (2000). The potential for using life cycle inventory analysis in local authority waste management decision making. *Journal of Environmental Planning and Management*, *43*(3), 351–367. https://doi.org/10.1080/09640560050010392

Qian, W., & Burritt, R. (2009). Contingency perspectives on environmental accounting: An exploratory study. *Accounting, Accountability and Performance*, *15*(2), 39–70.

Qian, W., Burritt, R., & and Monroe, G. (2011). EMA in local government: A case of waste management. *Accounting, Auditing & Accountability Journal*, *24*(1), 93–128. https://doi.org/10.1108/09513571111098072

Roome, N. (1992). Developing environmental management strategies. *Business Strategy and the Environment*, *1*, 11–24. https://doi.org/10.1002/bse.3280010104

Russell, W., Skalak, S., & Miller, G. (1994). Environmental cost accounting: The bottom line for environmental quality management. *Total Quality Environmental Management*, *3*(3), 255–268.

Ryan, C., Stanley, T., & Nelson, M. (2002). Accountability disclosures by Queensland Local Government Councils: 1997–1999. *Financial Accountability & Management*, *18*(3), 261–289. https://doi.org/10.1111/1468-0408.00153

Schaltegger, S., & Burritt, R. (2000). *Contemporary environmental accounting: Issues, concepts and practice.* Sheffield: Greenleaf Publishing.

Scott, W. (1995). *Institutions and organisations.* Thousand Oaks, CA: Sage Publications.

Scott, W., & Meyer, J. (1983). The organisation of societal sectors. In J. Meyer & W. Scott (Eds.), *Organisational Environments: Ritual and Rationality* (pp. 129–158). Beverly Hills, CA: Sage.

Strobel, M., & Redmann, C. (2002). Flow cost accounting: An accounting approach based on the actual flows of materials. In M. Bennett, J. Bouma, & T. Wolters (Eds.), *EMA: Informational and Institutional Developments* (pp. 67–82). Dordrecht: Kluwer Academic.

Tolbert, P., & Zucker, L. (1983). Institutional sources of change in the formal structure of organisations: The diffusion of civil service reform, 1880–1935. *Administrative Science Quarterly*, *28*(1), 22–39.

UNDSD (2001). *EMA procedures and principles.* New York, United Nations: United Nations Division for Sustainable Development (UNDSD).

USEPA (1995). *An introduction to environmental accounting as a business management tool: Key concepts and terms* (MC 7409). Washington, D.C.: Office of Pollution Prevention and Toxics. 20460, U.S. Environmental Protection Agency (USEPA) 742-R-95-001.

USEPA (1997). *Environmental accounting for municipal solid waste management: A handbook.* Solid Waste and Emergency Response (5305W), U.S. Environmental Protection Agency (USEPA) 530-R-95-041.

Wright, T. (2002). *Shaping the vision and strategy for sustainable waste management in New South Wales.* Prepared for Resource NSW by Wright Corporate Strategy Pty Ltd.

How to cite this article: Qian W, Burritt RL, Monroe GS. Environmental management accounting in local government: Functional and institutional imperatives. *Financial Acc & Man.* 2018;1–18. https://doi.org/10.1111/faam.12151