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Environmental Management Accounting

A Bibliometric Literature Review

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Abstract

Purpose – The paper investigates how environmental management accounting research has contributed to the profession. The accounting profession includes academics, practitioners and policy makers. The paper thus provides a detailed overview of the academic as well as the professional literature published in the field of environmental management accounting.

Design/methodology/approach – The research described in the paper develops and is based on a bibliometric database containing 766 (371 of them published in academic journals) publications in English, German and French with a publication date before 2011. Data on the publications, authors, theories referred to, and methods were collected, double-checked and analysed.

Findings – Analysing the bibliometric data reveals several novel findings. Among these is the identification of environmental management accounting papers in accounting journals. Although the number is growing, a substantial part of the publications have been published in non-accounting journals, books and as reports. In the course of research, a recent trend towards establishing specialised environmental (and sustainability) accounting journals became apparent. The above average rate of increase in the number of publications suggests that the field is enjoying a lot of interest from researchers and practitioners alike.

Originality/value – The paper is outlines trends and observations in the development of the field. A bibliometric analysis is undertaken and a broad range of publications considered in order to investigate the contribution of the environmental management accounting research to the development of the profession.

Paper type Literature review

Keywords Environmental management accounting, development, status, topics, methods, theories

1 Introduction

Environmental accounting, and particularly environmental management accounting (EMA), has gained considerable attention in academia as well as among international organisations, professional accounting organisations, and in corporate practice. This attention is reflected in a large body of academic literature, including scientific journal articles, books and working papers. Recently, various specialized journals have evolved and mainstream accounting and management journals have accepted publications in the field. Furthermore, EMA has become an increasingly popular topic for international organisations like the *UN Division on Sustainable Development* (UNDSD), or national and international accounting institutions like the *Association of Chartered Accounts* (ACCA), the *Institute for Chartered Accountants of England and Wales* (ICAEW), the Canadian Institute of Chartered Accountants (CICA), or the *International Federation of Accountants* (IFAC), which have published various reports and issued recommendations and guidelines.

The topic has emerged from a "twenty year niche issue" to a widely recognized topic, particularly for the last two decades (see e.g. Parker 2011). It is thus timely to ask the question "How has environmental management accounting research developed?" To answer this question it is necessary to review and analyse the existing EMA literature with regard to its origins and developments.

This paper investigates how environmental management accounting research has so far contributed to the profession. The accounting profession includes academics, practitioners and policy makers (see e.g., Evans et al. 2011). Based on several comments of renowned academics who indicated that academic accounting research has become increasingly detached from practice and society (e.g., Guthrie et al. 2011; Hopwood, 2007; 2008; 2009; Baldvinsdottir *et al.*, 2010; Malmi & Granlund, 2009; Owen, 2008), and given the substantial development in academic journals as well as the visible involvement of professional accounting organisations and international organisations, this paper considers both, academic and professional contributions to EMA.

This literature review takes a systematic approach by applying bibliometric methods (see e.g. De Bellis, 2009; De Solla Price, 1974; Jokic and Ball, 2006; Rider, 1944) to analyse past developments and to serve as a basis for recommendations for future research.

The paper is structured as follows: After a short description of the scope of research, i.e. what EMA encompasses, and a discussion of the few existing literature reviews on EMA and the remaining gap for a systematic review (Section 2), the chosen bibliometric approach is explained (Section 3). Section 4 reviews the descriptive statistical results with regard to the development of the number and type of publications, authorship, and citations. This analysis is supported by bibliometric evaluation based on *Bradford´s law* (Bradford, 1985), *Garfield´s law* (see De Bellis, 2009, 100ff.) and the *Ortega hypothesis* (see Cole and Cole, 1972) as well as a contents analysis of the publications and investigations of collaboration, regions of origin, topics covered and type of studies. Finally, new trends are discussed and conclusions are drawn for further research (Section 5).

2 EMA and existing literature reviews

2.1 Environmental management accounting (EMA)

This literature review covers all identified English, French and German publications which explicitly deal with corporate environmental accounting, particularly environmental management accounting (EMA). EMA is a part of the broader concept of accounting and an approach of corporate environmental information management which covers a set of accounting tools and practices to support company-internal management decision making on environmental and economic performance (see e.g. Gray, 1990; Gray and Laughlin, 1991; Schaltegger and Burritt, 2000; UNDSD 2002; IFAC 1998; 2005). EMA comprises a set of various accounting topics and methods, including environmental cost accounting, environmental investment appraisal, budgeting or financial planning, to mention some well-known tools (Burritt *et al.,* 2002).

Although the term was used quite differently in the earlier literature it seems that a fairly common understanding of EMA, as summarized above, has developed for the last two decades. A major influence may have been exerted by publications of the UN Division on Sustainable Development (UNDSD) involving many experts and stakeholders in the field (see UNDSD, 2002), and by the widely spread international guideline published by IFAC (2005). Also widely cited academic publications which do not differ substantially in their definitions of EMA such as seminal Gray's paper on

Corporate Environmental Accounting (Gray and Laughlin, 1991) or the book by Schaltegger and Burritt (2000) may have had some influence on shaping this common understanding.

2.2 Previous literature reviews

With the development of EMA, a few literature reviews have been conducted to date. Whereas most of these reviews summarise and describe the existing body of literature, a few authors have attempted to conceptualise a framework to map their findings e.g. Mathews (1997; 2004). Due to various limitations in scope and methods used in the identified literature reviews, however, the need for the following literature review was recognised.

So far, very few quantitative reviews of the existing Social and Environmental Accounting (SEA) and EMA literature exist (an exception is e.g. Ienciu *et al.*, 2010). However, various qualitative review studies have been conducted by Mathews (1997; 2004), Gray (2002), Parker (2005; 2011), Deegan and Soltys (2007), Thomson (2007), McGrath and Mathews (2008) and Owen (2008). The identified EMA review publications, or SEA publications with a literature review related to EMA, are listed in Table 1.

An analysis of the existing literature reviews published until 2010 reveals that they do not capture the current (state of) development of corporate environmental management accounting, as they either deal with environmental accounting on a general and even national level (e.g. Ienciu *et al.*, 2010), or are older publications (e.g. Mathews, 1997; 2004; Gray, 2002) and not up-to-date anymore, as the field has been developing rapidly.

The first published systematic review paper was completed by Mathews (1997), who covered twenty-five years of social and environmental accounting research, which, however, was characterized by very few publications until then. He classified the contributions by periods, and whether they were "empirical studies", "normative statements", "philosophical discussions", "radical/critical literature", "non-accounting literature", "teaching programmes and textbooks", "regulatory frameworks" and "other reviews of the literature". Subsequently, Mathews (2004) took his approach one step further by developing a matrix approach of categorization with the perceived underlying philosophies. A well-cited, older paper published in the journal *Accounting, Organization*

and Society by Gray (2002) provides a well-structured review of all contributions in the social accounting field. Both qualitative analyses provide comprehensive references and excellent introductions for anybody who is looking for an introductory overview of the literature on environmental accounting. Neither of these reviews conducts a quantitative analysis with bibliometric measures and, given their date of publication, neither covers more recent publications.

Table 1: Reviews of EMA literature

Author(s)	Title	Published in	Focus	Type	Year
Mathews	Twenty-five years of social and environmental accounting research: Is there a silver jubilee to celebrate?	AAAJ	Identifies theory building approaches	qualitative, categorization	1997
Gray	The social accounting project and Accounting, Organizations and Society Privileging engagement, imaginings, new accountings and pragmatism over critique?	AOS	All existing publications on EA	qualitative, conceptual	2002
Mathews	Developing a matrix approach to categorise the social and environmental accounting research literature	QRAM	social and environmental accounting	qualitative, conceptual categorization	2004
Parker	Social and environmental accountability research	AAAJ	social and environmental accounting	qualitative	2005
Deegan and Soltys	Social accounting research: an Australasian perspective	Accounting Forum	Social accounting	qualitative	2007
Thompson	Mapping the terrain for sustainability accounting	Book chapter	Environmental accounting research	qualitative, descriptive	2007
Owen	Chronicles of wasted time? A personal reflection on the current state of, and future prospects for, social and environmental accounting research	AAAJ	Social and environmental accounting	qualitative	2008
McGrath and Mathews	Moving to Sustainability: An Application of a Matrix Model to Gain Insight into the Research Literature	Accounting, Accountability & Performance	Sustainability	qualitative, conceptual categorization, link to practice	2008
Branco and Delgado	Research on social and environmental accounting in Southern European countries	Revista Española de Financiación y Contabilidad	Southern European countries	quantitative, descriptive	2009
Ienciu *et al.*	Status of research in the field of environmental accounting	Research report	Publications in accounting journals	quantitative, descriptive	2010

More recently, Thomson (2007), in the book *Sustainability Accounting and Accountability,* conducted a well-received qualitative analysis of the broader field of sustainability accounting. The review, however, only addresses the better known

academic English publications (similarly, Parker 2011 focuses on SEA publications between 1998 and 2008 in six leading journals). It does therefore not give an overview or quantitative analysis of further developments which were influenced by continental European academics and professionals.

A recent quantitative review study showing descriptive statistical data between 1988 and 2009 on environmental accounting research was published by Ienciu *et al.* (2010). Their focus is narrow in terms of publication type, focusing on papers published in accounting journals only, and broad in scope, including national environmental accounting, financial environmental accounting, and auditing. Thus the review does not provide an overview and analysis of the development of environmental management accounting literature in general. McGrath and Mathews (2008) touch on the link between accounting research and the profession but do not consider literature from professional accounting organizations, or international organizations.

Another example of limitations is the 2009 paper of Branco and Delgado (2009) that "explores the role of Southern European academics within social and environmental accounting (SEA) research". Similarly, Deegan and Soltys (2007) follow a geographic focus by discussing an Australiasian perspective of social accounting and how phD-students are taking up the topic. Given the geographical scope, the conclusions of these review papers do not represent the broader international developments of EMA (for a discussion of how global or local accounting is as a discipline, see e.g. Lukka and Kasanen, 1996).

In addition to these review papers, numerous attempts exist to classify different approaches or methods of environmental accounting. These papers usually focus on an even more narrow selection of papers. In France, Richard (2009) developed a framework to qualify the different types of contributions according to criteria such as the relationship with the environment, the environmental dimension, the spatial dimension of the information, the degree of detail of the information, the type of valuation of the data, and how the result is conceptualized. Mathews (2004) also developed a matrix approach to classify the different contributions in terms of underlying philosophy (from normative/critical to positive/business case) and in terms of direction of action (not supporting the status quo, to "limited to action where profitable"). Furthermore, Brown and Fraser (2006) introduce an overview of the conceptual landscape, dividing it into three approaches: the business case approach, the

stakeholder-accountability approach and the critical theory approach. Similarly, Cullen (2006) groups the literature, however, only in two categories: the "conservative approach", which she says, "characterizes the mainstream literature in EMA" and the "critical approach" most prominently represented by Gray's work. Another well-received paper by Burritt *et al.* (2002) proposes a framework for EMA and allocates existing literature to different decision situations.

This overview of publications reviewing the environmental and environmental management accounting literature shows that no publication exists which:

- investigates how environmental management accounting research has contributed to the profession, including academic and professional contributions,
- covers both, academic literature and publications by professional accounting organizations, and
- conducts a systematic quantitative analysis based on acknowledged bibliometric methods,
- captures the more recent developments in EMA publications since the internationally influential practitioner oriented publications of the UNDSD in 2002 and IFAC in 1998.

The next section explains the scope of research, the basic idea of bibliometric analysis and the methods applied in this review article.

3 Scope of research and methods of bibliometric analysis

3.1 Scope of research

The scope of the following literature review on EMA publications encompasses all management accounting approaches which are explicitly used in EMA (e.g. key performance indicators, the balanced scorecard, etc.) thus considering a broad range of company-internal environmental accounting and all environmental management accounting methods ranging from full cost accounting to total cost assessment, material flow cost accounting, life-cycle costing, and accounting tools dealing with corporate investments, natural equity accounts of companies, etc. (see Table 2). Also considered are papers focusing on specific issues such as carbon accounting (e.g. Hoffmann and

Busch, 2008; Burritt *et al.*, 2011), natural capital/biodiversity accounting (e.g. Houdet, 2009), water accounting (e.g. UNEP, 2009), or material flow and waste accounting (e.g. Jasch, 2009), etc. as long as they have a clear focus supporting corporate management decisions.

Since the field of EMA is fairly interdisciplinary (e.g. Gray, 2000), and – until recently – not considered as a long established "mainstream" accounting topic (e.g. Schaltegger and Burritt, 2006; Burritt and Schaltegger, 2010), also general management and environmental management contributions are included and accounting publications, in addition to those published in peer-reviewed journals, such as e.g. contributions published in professional body journals, or as conference papers, working papers, books, PhD-dissertations or reports by NGOs, professional bodies, or governments.

The identified authors are either associated to the academic community in accounting and/or management studies and/or environment sciences, or sometimes publish for the business community (such as the "Big Four" accounting firms), or for NGOs (such as the World Resource Institute - WRI) or international organizations (such as the UN).

3.2 Methodological approach

The bibliography on environmental management accounting was compiled starting with nearly one hundred papers on EMA found in earlier literature reviews and complemented by more recent publications in journals and by academic book publishers who have already published in the area of EMA. In this process the research focused on publications on the corporate level and environmental management accounting. Publications in the three major (globally and in Europe) languages – English, French and German - were considered, covering a total of 44% of the population of the European Union member states and 41% of the population in the OECD countries (http://stats.oecd.org/Index.aspx). Furthermore these are also the three largest economies in Europe currently with major academic institutions and established professional accounting organisations. With a "snowball principle" reviewing the literature lists of these first one hundred publications further EMA publications were identified. This way 497 journal articles, working papers, reports and books were collected. The enlarged bibliography was complemented further with the following process:

- Systematic search of papers in 88 academic journals listed in Appendix 1. The research was conducted with major databases including *ebsco*, *proquest*, *sciencedirect* and *emerald*.
- Examining the websites of all major accounting, management and environmental and sustainability management journals. The search was run at minimum on basis of the publication title, and mostly (wherever possible) on basis of the abstract and/or the full text.
- The search was also conducted on SSRN with the keywords listed in Table 2, and on the *proquest* search for PhD theses.
- Crosschecking the accessible publication lists of established research institutes such as the Centre for Social and Environmental Accounting Research (CSEAR) in St. Andrews, UK, the *Centre for Accounting, Governance and Sustainability* (CAGS), Adelaide, Australia and the *Centre for Sustainability Management* (CSM) in Luneburg, Germany, etc.

Excluded from the scope of this research were publications with a main focus on reporting, auditing, national environmental accounting, or social accounting in a more narrow sense, dealing with social issues only and not covering environmental topics. Furthermore, company reports, including environmental and sustainability reports, advertisement brochures of accounting firms and the like were not considered.

As a result of this literature search a robust bibliographic database of English, French and German publications between 1973 and (including) 2010 was collected with the following characteristics:

- 766 EMA publications in total, including peer-reviewed journal papers, reports, books, and book chapters,
- written by 650 authors
- of the 766 publications 371 are journal papers,
- published in 83 peer-reviewed and academic journals,
- of which only 17 published in the *Financial Times* list of highly recognized management journals (FT 2010): 14 publications in *Accounting, Organizations and Society*, and 3 publications in the *Journal of Business Ethics*.

Table 2: Keywords used for the search of EMA publications

English keywords	French keywords	German keywords
carbon accounting	comptabilité environnementale	Abfallrechnungswesen (incl. Abfallkostenrechnung)
environmental accounting	contrôle de gestion environnemental	Controlling
environmental management accounting	comptabilité verte	Informationsmanagement
ecological accounting	comptabilité carbone	Materialflusskostenrechnung
eco-control	comptabilité écologique	Öko-Controlling
full cost accounting		Nachhaltigkeitscontrolling,
green accounting		Rechnungslegung (incl. ökologi-sches Rechnungswesen)
material flow cost accounting (incl. mass balance accounting)		Umweltcontrolling
sustainability accounting		Umweltinformationsmanagement
sustainability balanced scorecard		Umweltkostenrechnung
total cost assessment		Umweltrechnungswesen
triple bottom line accounting		
waste accounting		
water accounting		

With the methodological triangulation of snowballing, database search and internet-based search a most comprehensive database was aimed at. This searching approach strove for a collection of academic journal papers but also EMA contributions beyond journals, including academic books, book chapters, PhD-dissertations, conference papers, working papers, and reports by professional accounting organizations. To avoid repetition, working papers which have been developed to a publication until the end of 2010 were not considered; only the final publication was counted.

The analysis of the data required several decisions. Firstly, a publication was not attributed to one single country as co-authors are often from different countries. Instead the contributions of authors were counted with regard to the country of their home institutions. Secondly, the type of publication was decided on basis of whether it is a single publication with a professional publisher, a publication as part of a series of books, a journal with regular issues for various years and an ISSN, or a report or working paper issued by a professional accounting or consulting institution. This categorization is not always straight forward, as for example the publication by Freedman (2010), *Advances in Environmental Accounting & Management*, shows. Even the publisher Emerald uses two different descriptions by grouping the publication

under “book series” while promoting it with: “The journal has three main objectives” (see Emerald, 2011). Whatever the reasons for this discrepancy are, for the purposes of this bibliometric research this publication is classified as a book in a series of books as it has been published irregularly over the years.

Data was collated with Excel on a number of work sheets as to allow for an extensive analysis. Among the analysed data are:

- Historical development of the volume of publications by year
- The type of publications – e.g. scientific papers, reports, etc.
- The number of publications per author
- The number of authors per publication
- Citations
- Etc.

Apart from author and citation analysis, further analyses of the collected publications were also carried out. They aimed at identifying further properties of the publications such as type of research (empirical, conceptual, normative), methods deployed, theoretical framework, etc. The collection of data (see Section 4.5) was carried out by two or three researchers independently to minimise error and bias – a method improving the inter-coder reliability (see Hayes and Krippendorff, 2007).

It has to be noted that the triple search approach based on earlier literature review papers, snowballing and electronic search has its limitations. Furthermore, publications in languages other than English, French and German were not considered. Nevertheless, for the purposes of the following analysis it can be expected that most of the major publications in the area would be referred to in one of these three major European languages.

4 Results of the bibliometric analysis

After a descriptive discussion of the development of the total number of publications and publication types (journal papers, books, etc.) authorship, publication type and contents are analysed. Thus the analysis follows the logic of general development of the field of EMA where, by which journals, by whom, and what?

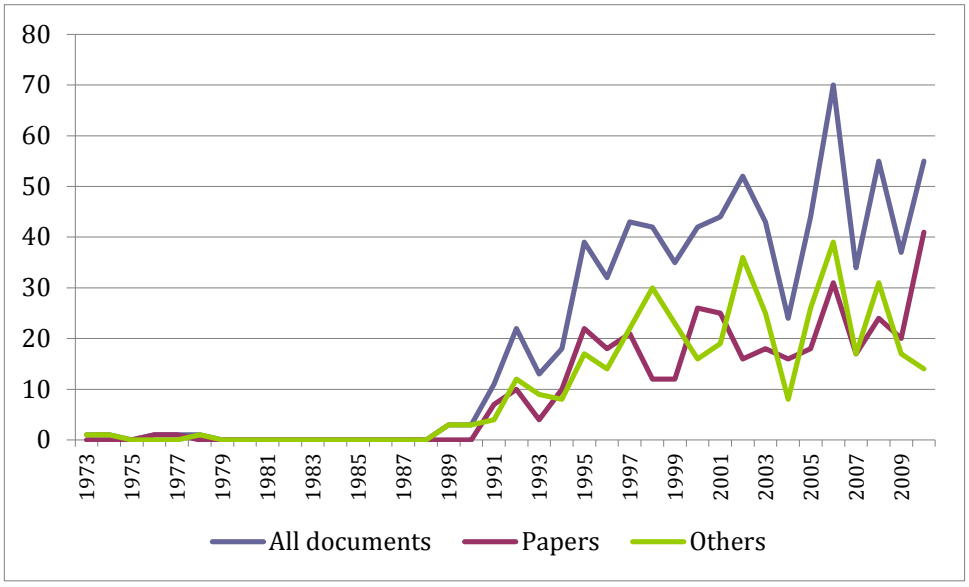
4.1 Historical development of EMA publications

Environmental accounting can be considered a "rare orchid" topic playing a negligible niche role until 1990 in terms of academic publications, although the first books and papers (in AOS) were published already in the 70s. Figure 1 shows the numerical development of the total number of EMA publications as well as the journal and other publications (including books, book chapter, working papers and reports).

In terms of the number of publications the field remains negligibly small until 1990 (below 3 publications per annum) and then "explodes" with a strong increase until 1997 (up to more than 40 publications per annum) and a much smaller average increase between 1997 and 2010. Since 1997 the development has been characterized by strong outlays with lows particularly in 2004, 2007 and 2009 and with peaks in 2002, 2006, 2008 and 2010.

Although a chart depicting the number of publications cannot show a cause and effect relationship, the rapid development of EMA research and the turning point (when the number of EMA publications started to grow substantially) can be identified after the publication of the Brundtland Report in 1987 as well as the book by David Pearce (in 1989) and Gray's (Gray, 1990) response to it.

Figure 1: Historical development of the number of EMA publications



The fluctuation and the peaks in the number of EMA journal publications can be attributed to special issues and edited books published in these years. Due to the low total number of publications, the publication of two special issues and an edited book can result in doubling the volume of publications compared to adjacent years. Examples of the influence of these special issues with usually between five and ten papers on environmental accounting are the years 1997 (*Accounting, Auditing and Accountability Journal*, AAAJ), 2002 (AAAJ), 2006 (*Business Strategy and the Environment* with 5 papers, *Journal of Cleaner Production* with 8 papers), and 2010 (AAAJ) whereas the number of edited books influences the "other" publications to a large degree (e.g. Bennett *et al.*, 2003 with 17 authored contributions, Rikardsson *et al.*, 2005 with 17 authored contributions, Schaltegger *et al.*, 2006 with 30 authored contributions, Schaltegger *et al.*, 2008 with 27 authored chapter contributions). As Section 4.3 shows, the editors and guest editors of these special issues and books are among the driving contributors of other EMA publications, too.

Despite discrepancies in the number of papers and other publications, a correlation analysis provides a correlation factor of 0.78 (level of significance 0.05), suggesting a strong correlation in the number of academic and other publications for the period between 1973 and 2010. Figure 1, however, shows that until 1989 various years are without any EMA publications thus distorting the correlation results. A correlation analysis for the period between 1989 and 2010 shows a correlation factor of 0.51 (level of significance 0.05) with only a weak correlation between the research published in scientific journals and research in other media such as books, book chapters, reports or working papers. Thus no general indication could be found that the number of academic journal papers is related to other publications.

Figure 1 reveals several conclusive bibliometric observations. One bibliometric observation in scientific literature in general is that *a research area grows by doubling the publications in ten to twenty years* (de Solla Price, 1974; Rider, 1944). With regard to the development of the EMA literature, the total number of publications on EMA between 1973 and 1990 was equal to the number of related publications published in the succeeding year 1991 (11 in one year versus 11 in total for all years before 1990). This is a much higher growth rate than the doubling of knowledge in 10 to 20 years as observed in many academic disciplines and known *as exponential increase of knowledge* (de Solla Price, 1974). Looking at the next decade, the period between 1991 and 2000

saw 297 publications on EMA, a volume that was multiplied by 1,5 in the most recent decade (2001-2010) with 458 publications. This development of the discipline of environmental management accounting shows a growth well over the 3,5% annual increase observed in established disciplines, therefore suggesting that EMA is i) a young discipline ii) with very substantial growth and development, especially in recent years, and that EMA is likely to see further expansion in the future.

4.2 Journals contributing to EMA

Academic journals play an important role in the development of a discipline and a topic as they reflect topical priorities of academic discussion and fundamental research, and the acknowledgement in the respective scientific community. The only *accounting journal* in the *Financial Times* list of highly acknowledged journals which has published on environmental accounting until 2010 is *Accounting, Organizations and Society* with 14 publications between 1976 and 2010 (Table 3). Among the top ranked journals (A or A* qualified) the *Accounting, Auditing and Accountability Journal* (AAAJ) has published most on environmental accounting, followed by *Accounting Forum* and *Critical Perspectives on Accounting*. AAAJ has issued several special issues on the subject (1991, 1997, 2002, 2007, 2010), contributing substantially to the peak of literature in those years (see Figure 1).

Table 3: Journals with most publications on EMA

Journal Name	Topic	Publications	Country
Accounting, Auditing and Accountability Journal	Accounting	30	Australia
Accounting Forum	Accounting	25	Australia
Journal of Cleaner Production	Environmental Management	24	USA
Critical Perspectives on Accounting	Accounting	22	UK
Journal of the Asia Pacific Centre for Environmental Accountability	Environmental Accounting	21	Australia
Controlling	Management Control	17	Germany
Business Strategy and the Environment	Environmental Management	15	UK
Accounting Organisations and Society	Accounting	14	UK
Social and Environmental Accounting	Environmental Accounting	14	UK
Greener Management International	Environmental Management	11	UK

Also *environmental and sustainability management journals* play a major role in EMA Research. The *Journal of Cleaner Production, Business Strategy and the Environment,* and *Greener Management International* are among the main contributors to EMA publications. Many publications in these journals take a broader view on environmental accounting by highlighting obstacles of introducing EMA, use of EMA information for strategic purposes, etc.

Placed between these two groups is the German journal *Controlling*, which focuses on management control and the use of accounting information. This is also the only non-English-speaking journal among the academic journals with most EMA publications.

The third group of journals with a large share of the total EMA journal publications are more *specific social and environmental accounting journals* (Table 4) such as *Social and Environmental Accounting*, and *Journal of the Asia Pacific Centre for Environmental Accountability*. Albeit specialized on environmental accounting, they are fairly young and often have fewer issues per year, which so far results in a lower total number of EMA publications than other, long-established journals.

An interesting observation can be drawn by applying another bibliometric tool – *Bradford's law*. Bradford (1985) described a pattern and predicts the distribution of publications in core, related, and sporadically related journals. He postulated that the number of publications in core journals *(n)*, i.e. these journals where most publications in one field are found, is the same as the number of publications found in the next related journals (n^2). In our sample of 371 publications in 83 scientific journals, the first 122 publications are concentrated in 5 journals (see Table 3), the next 128 publications are found in (the following) 12 journals and the remaining 121 publications are scattered among further 66 (hardly related) journals. These numbers reveal an underrepresentation of related and slightly related journals compared to the number of core journals. Whereas an over-proportionality of related journals could have been expected due to the interdisciplinary nature of EMA, the distribution of publications suggests that the core area is represented more strongly and plays a more active role compared to the whole research field and other scientific disciplines in general.

Table 4: Number of EMA publications in specialized journals

Journal Name	Publications	Started	Country
Journal of the Asia Pacific Centre for Environmental Accountability	21	1995	Australia
Social and Environmental Accounting	14	1981	UK
Issues in Social & Environmental Accounting	7	2007	Indonesia
Sustainability Accounting, Management and Policy Journal	3	2010	Australia

As Table 4 shows this is even more the case with specialized journals in environmental and sustainability accounting (e.g. *Issues in Social and Environmental Accounting* started in 2007, *Sustainability Accounting, Management and Policy Journal* started in 2010). With the exception of *Social and Environmental Accounting* most of the specialized journals have started more recently, thus indicating that a shift of the total number of publications towards specialized journals may be expected in the future.

4.3 Authorship

Authors in any field of research have an impact of how this field is shaped. According to the *Ortega hypothesis* (Cole and Cole, 1972) *scientific progress is based on the work of a small number of researchers* and authors in each field. For the research field of EMA, only 15 (2.3%) out of 650 authors contribute towards 333 (43.5%) publications out of the 766 publications (see Table 6). The proportion of authors to the overall contribution to the field remains similar when only journal publications are analysed. Again, 15 (3,8%) authors contribute to 162 (44%) of the 371 publications (Table 5). This can also be attributed to the high number of "one-off" authors who conduct their research in related areas and often have one single publication in the field of EMA.

Several further observations can be made by looking at the major contributors in the field. The order of the authors with most journal papers (Table 5) is somewhat counterintuitive. Since this review focuses on environmental management accounting literature, it appears surprising that Rob Gray and Jan Bebbington are in the lead, given that their work is focused on the critical perspective of social accounting (see Burritt and Schaltegger, 2010 for a taxonomy of sustainability accounting). This observation

can, however, be explained with Gray's earlier work, when he produced numerous publications with case studies within various organisations.

Table 5: Major contributors in published journal papers on EMA (out of 394 authors with paper contributions)

Author	Number of academic journal papers
Gray, Robert	24
Bebbington, Jan	20
Schaltegger, Stefan	19
Burritt, Roger	19
Mathews, Reg	13
Lehman, Glen	9
Günther, Edeltraud	8
Jasch, Christine	7
Owen, David	7
Thomson, Ian	7

Table 6: Major contributors of publications on EMA in total (out of 650 authors)

Author	Number of publications
Schaltegger, Stefan	59
Burritt, Roger	44
Gray, Robert	36
Bebbington, Jan	30
Bennett, Martin	25
Jasch, Christine	24
Mathews, Reg	15
Günther, Edeltraud	15
James, Peter	15
Hahn, Tobias	13
Wagner, Marcus	13

Table 6, on the other hand, presents the major contributors to the overall volume of publications. The order of authors in this table differs from the previous, with Schaltegger and Burritt as being most productive. The discrepancy between the two tables can be explained with the stronger focus of some of the researchers on practice-oriented topics, whereas others have concentrated on purely academic research and academic journal publications.

The number of authors was also investigated with regard to the bibliometric indicator of *co-authorship*. De Solla Price (1981) first observed for a developing research area *an increase in multiple authorship of publication over time.* Later research supports this empirically in various fields (Cronin, 2001). The average number of authors in the 371 EMA journal publications was 1.74, with 51% of the publications having two or more authors and 16% having three or more authors. This number (1.74) is above average across all research areas, 1.45 being the average for 2000 (Jokic and Ball, 2006). With more than 20% above the average, this deviation may be attributed to the *interdisciplinary character of EMA.* In fact, an analysis of the publications in the *American Journal of Sociology* carried out in 2000 (Jokic and Ball, 2006) revealed that 45% of the publications had more than one author, which is lower than in our sample. Similarly,

Kyvik (2003) observed that 43% of the scientific Norwegian publications in social sciences had more than one author, an even lower figure.

4.4 Publications by countries

Another analysis of the EMA literature deals with the "geographic hotspots" of EMA research. This was done by counting the number of authors for each country in which the institutional affiliation of the researcher is located. For the analysis *only authors with two or more publications* were considered in order to exclude authors with a marginal connection to EMA research. Table 7 and Table 8 summarise the results of this analysis.

Table 7: Hotspots of EMA research by number of publications

Country	**Total contribution (no.)**	**Journal papers (no.)**	**Journal publications in percentage of total**
UK	196	99	51%
Germany	178	62	35%
Australia	119	80	67%
USA	60	27	45%
France	44	7	16%
Japan	30	3	10%
Canada	29	12	41%
The Netherlands	28	10	36%
Austria	26	7	27%
New Zealand	23	17	74%

Table 8: Number of contributors with two or more publications and total number of publications and journal publications by country

Country	**Contributors with two or more publications (out of 166)**	**Total Publications per author**	**Contributors with two or more journal publications (out of 83)**	**Journal publications per author**
UK	26	7.5	16	6.2
Germany	26	6.8	12	5.2
Australia	19	6.3	16	5.0
USA	18	3.3	8	3.8

Overall, Europe, particularly the UK and Germany, is leading in total volume of publications. Other countries such as Italy, the Netherlands, Denmark or Spain have a more sporadic record of publications. Recently, the Asian-Pacific region has been very productive, with numerous publications by Australian researchers and Japan catching up for the last couple of years. The first EMA publications outside of Europe, Australia, New Zealand, and the USA were authored by Japanese academics and released in 2001. Compared to scientific management and accounting publications in general, EMA seems to be underrepresented in the USA (Table 7). The fact that the US is in the list of the most contributing countries with authors having published two or more papers in EMA can be explained by the observation that many US contributions were produced by the US Environmental Protection Agency, the World Resource Institute and Tellus Institute, i.e. by the few organisations who were linked to the environmental accounting project in the 1990s. The current relatively narrow geographic spread of research does not support comparative empirical studies on a broad multinational basis.

Another interesting aspect is the strong journal focus of researchers in New Zealand and Australia (74% and 67% journal publications) compared to the low journal coverage in Japan (10%), France (16%) and Austria (27%). In these countries, books and edited volumes seem to play an important role.

Table 8 also shows that some countries like the United Kingdom and Germany have a broad basis of academics contributing to EMA (26 authors each with two or more publications) whereas the research in France and Japan relies on fewer researchers (10 and 7, not shown in Table 8). The total productivity per author with two or more publications on the other hand is highest in the UK, Germany and Australia with 6,3 to 7,5 publications per author. This productivity figure, shown in the third column in Table 8, is calculated as the total number of publications (second column in Table 7) divided by the number of contributors (third column in Table 8). The journal publication productivity (last column in Table 8) is derived the same way by dividing the figures in the third column in Table 7 by the fourth in Table 8. The ranking in productivity is basically the same for journals as for publications in total in spite of the large differences between these countries in the preferred publication media (e.g. Australia with 67% of all EMA publications being journal publications compared to Germany with 35% journal publications).

The above geographic hotspots are also reflected by the place of origin of the leading journals in EMA (Tables 3 and 4). Five of the ten most influential journals in the field are UK-based and three are Australian-based.

4.5 Most cited EMA publications

Citations are a measure of how often a publication has been referred to and thus how influential it is. A higher citation score shows that the contents of the publication have been received and discussed intensely in the scientific community. As of March 2011, 15 documents have been cited over a 100 times in Google Scholar (Table 9). The citation scores of ISI Web of Knowledge and Scopus were also collected in March 2011. A dash in Tables 9 and 10 indicates that a publication was not found in the ISI Web of Knowledge or Scopus database, whereas a zero indicates that it is in the database but has not been cited so far.

The two most cited publications are books written by the four most active contributors to the field of EMA. Considering the authors, the most influential author in environmental accounting is Professor Rob Gray who has five publications among the fifteen top cited publications on EMA. This is even more obvious when considering journal papers only (Table 9).

The citation numbers were obtained from Google Scholar, ISI Web of Knowledge (ISI WoK) and Scopus. Due to the nature of ISI WoK and Scopus, the figures are much lower than those in Google Scholar, although they display a similar trend. One of the major observations is that only 27 articles have one or more citations in ISI WoK, of which only six papers have ten or more citations. This may be an indication that EMA is still a research are which is not very well linked into other, more conventional, and often cited research areas.

Table 9: Most cited publications in environmental accounting and EMA

Title of publication	Autor(s)	Year	Google Scholar	ISI Web of Knowledge	Scopus
Accounting for the environment. The greening of accountancy part II	Gray	1993	487	-	-
Contemporary environmental accounting: issues, concepts and practices	Schaltegger and Burritt	2000	305	-	-
Accounting and environmentalism: An exploration of the challenge of gently accounting for accountability, transparency and sustainability	Gray	1992	290	42	124
Twenty-five years of social and environmental accounting research. Is there a silver jubilee to celebrate?	Mathews	1997	246	-	-
On the measurement of the environmental performance of firms. A literature review and a productive efficiency perspective	Tyteca	1996	176	93	118
The sustainability balanced scorecard. Linking sustainability management to business strategy	Figge *et al.*	2002	169	-	60
Corporate environmental accounting	Schaltegger *et al.*	1996	140	-	-
Disclosing new worlds. A role for social and environmental accounting and auditing	Lehman	1999	128	18	67
Measuring eco-efficiency: A guide to reporting company performance	WBCSD	2000	125	-	-
Sustainable value added. Measuring corporate contributions to sustainability beyond eco-efficiency	Figge and Hahn	2004	121	43	58
Green Ledgers: Case Studies in Corporate Environmental Accounting	Ditz *et al.*	1995	110	-	-
The Greening of Accountancy: the profession after Pearce	Gray	1990	108	-	-
An account of sustainability: Failure, success and a re-conceptualisation	Bebbington and Gray	2001	104	-	34
Environmental indicators for business: a review of the literature and standardisation methods	Olsthoorn	2001	103	-	56
The Greening of Enterprise: An Exploration of the (NON) Role of Environmental Accounting and Environmental Accountants in Organizational Change	Gray	1995	103	-	38

Also a notable observation revealed by the citation analysis is that like other (established) fields of research, only few scientists contribute to scientific progress in the field (Garfield´s law, De Bellis, 2009). Of the 650 authors, only the 43 most productive authors have 5 or more (often co-authored) publications. However, given the large number of authors with a single publication on EMA (488, 74.7 %), the

contribution of the large majority to the field is still essential for its progress. This observation may be explained with the interdisciplinary nature of EMA: it combines knowledge in the fields of business administration, accounting, environmental management, etc. Although a relatively small group of leading authors has been shaping the research area, they tend to involve or motivate different co-authors (such PhD students) to contribute to EMA research.

Table 10: Most cited journal papers in environmental accounting and EMA

Title of publication	Author(s)	Year	ISI WoK	Scopus	Google Scholar
Accounting and environmentalism: An exploration of the challenge of gently accounting for accountability, transparency and sustainability	Gray	1992	42	110	290
Twenty-five years of social and environmental accounting research: Is there a silver jubilee to celebrate?	Mathews	1997	0	-	246
On the measurement of the environmental performance of firms. A literature review and a productive efficiency perspective	Tyteca	1996	93	118	176
The sustainability balanced scorecard- linking sustainability management to business strategy	Figge *et al.*	2002	0	67	169
Disclosing new worlds: a role for social and environmental accounting and auditing	Lehman	1999	18	67	128
Sustainable value added. Measuring corporate contributions to sustainability beyond eco-efficiency	Figge and Hahn	2004	43	62	121
An account of sustainability. Failure, success and a reconceptualisation	Bebbington and Gray	2001	0	-	104
Environmental indicators for business: a review of the literature and standardisation methods	Olsthoorn *et al.*	2001	0	57	103
The greening of enterprise: An exploration of the (NON) role of environmental accounting and environmental accountants in organizational change	Gray *et al.*	1995	0	42	103

4.6 Analysis of theories applied, types of study and topics

4.6.1 Analysis of theories used

One of the content analyses carried out investigated the underlying theories in EMA literature. For this analysis two kinds of theory were distinguished. On the one hand

established theories applied in management science, used for explaining EMA approaches and developments and used for predicting empirical observations in the field of EMA were searched for. These are well-known theories such as "transaction cost theory", "contingency theory", etc. which are often used in academic accounting and management publications. On the other hand "practical" or *practice-oriented theories* (see Malmi and Granlund, 2009; Quattrone, 2009) which seek to provide useful approaches to practitioners were considered. Malmi and Grandlund (2009) argue that e.g. a costing theory would have much higher value to accounting professionals than "borrowed" economic of management theories that only partially explain why activity-based costing can be superior over other costing approaches.

Only 13% of empirical EMA publications explicitly refer to the type of well-known, established academic theories, whereas the *vast majority of publications attempts to develop a practice-oriented EMA theory or approach* which seeks to explain what EMA is, how it contributes to corporate environmental performance as well as how it can be or has been applied and how it is likely to further develop. The two most applied theories are the neo-institutional theory and contingency theory (however only 8 and 6 publications representing 3,4% and 2,5% of total empirical studies each).

4.6.2 Type of studies

For the analysis of the type of studies (i.e. whether they are rather normative, conceptual, literature reviews, or empirical) all publications were considered which could be obtained electronically or in hard copy (i.e. are not out of print). Thus, 617 publications (81% of the total) were examined in more detail.

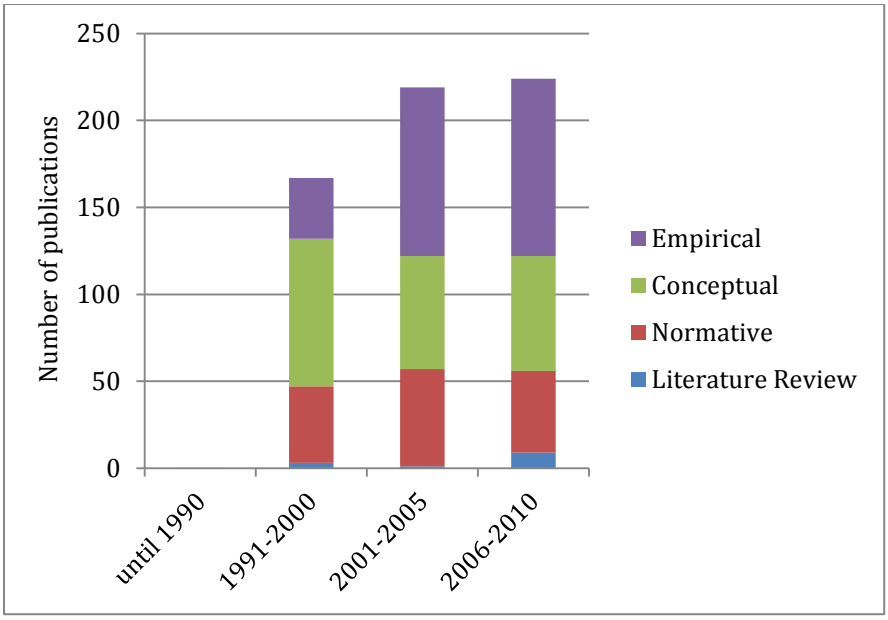
234 of these 617 publications on EMA present empirical research. The number has steadily increased from 0 before 1990, to 35 (21% of all publications) in the decade between 1991-2000 to now 199, or 46% of the most recent publications (2006-2010). Until 2000, most publications, also in academic journals were normative or conceptual. The very low number of empirical publications may be a result of the relative novelty of EMA and the short history of application in corporate practice at this time (Schaltegger and Burritt, 2000). Parker (2011) found a similar development for the broader area of SEA literature in six leading accounting journals where empirical research has only recently picked up. Furthermore, meta-studies using secondary published data based on

the existing EMA body of literature have so far not been produced. This is maybe a consequence of the few empirical papers which differ strongly with regard to their scope, time span and methods they apply.

The above considerations are supported when considering the type of empirical research. 74% of empirical publications are of qualitative nature – most often a single case study was used to identify, describe or visualise a very specific EMA-related topic only.

Just 26% of these empirical papers are of quantitative nature. A possible explanation for the relatively low number of quantitative empirical research is the small number of analytical qualitative research which often serves to provide empirically testable theories on EMA. Most of the qualitative research, particularly the earlier literature, is descriptive rather than theory based.

Figure 2: Type of EMA publications over time



This relates to the relative novelty of EMA when it started to rapidly develop as a research area. Although the first books and journal papers were published in the 70s, it was not before 1992 that the research area started to boom with a larger volume of publications (Figure 1). The majority of companies thus cannot be expected to have many decades of EMA experience, thus leaving empirical researchers without a large databasis of corporate practices.

Furthermore, only very few publications seem to highlight paths to a systematic quantitative research, i.e. to address the questions such as what data would be needed to test theories.

4.6.3 Topics of research

The two topics of EMA which have attracted most attention are environmental cost accounting with 36 documents, closely followed by environmental indicators with 33 documents. Furthermore, topics dealing covering the sustainability involvement of the accounting profession (34 publications), or how SEA should be taught (28 time), have been dealt with extensively.

Although in total, the discussion of EMA tools and methods has been covered by many publications, no single approach has attracted very high attention. Among the top scorers are: Sustainability Balance Scorecard (14 publications), Material flow Cost Accounting (12 publications), Full Cost Accounting (9 publications), Total Cost Assessment (7 publications). Carbon accounting, which has just recently been taken up, has already shown a strong development with 14 publications, and water accounting has been discussed in as many as 6 publications for the last few years. On the contrary, biodiversity accounting, with early papers in the 90s, has not picked up and, inspite of the International Year of Biodiversity in 2010, is still rarely addressed.

Surprisingly, topics such as the public sector, investment, budgeting, agriculture related accounting and SMEs have barely been tackled.

5 Conclusions

The review and analysis of existing literature for various kinds of English, French and German publications on EMA shows the following core results.

- *Growth:* The field (environmental management accounting and also the coverage of environmental accounting topics in papers on sustainability accounting, including specific topics such as carbon accounting, etc.) is developing substantially a) in terms of the number of publications (766 in total, 371 in journals, 395 in the other publication categories such as books and book

chapters), and b) in terms of the number of journals with a specific focus. This shows that the discipline of environmental and sustainability accounting has been established as a sub-discipline of accounting and management in the academic literature over the last two decades mainly.

- *Mainstreaming:* The number of publications in mainstream accounting and management journals has increased steadily. This shows that the topic has been taken up by mainstream accounting and management academic circles. Environmental management accounting is going mainstream and has been acknowledged as an important contribution to accounting and (sustainability) management in general. Also former literature reviews support the establishment of the field.
- *Authors and regions contributing and dominating the academic discussion:* The authors who influenced and influence the literature most as well as the countries where the discussion is flourishing most are the UK, Germany and Australia. This shows that the topic of environmental and sustainability accounting is mainly discussed in a small part of the European world and Australia. More recently, however, especially Asian academics have started to deal with EMA, too. Furthermore, even more recently EMA has been introduced in developing countries through empirical research mainly (Viere *et al.* 2007; Li 2004; Lodhia 1999; Burritt *et al.* 2009).
- *Research community is growing:* The number of authors dealing with environmental management accounting has increased steadily. This shows that the topic has gained ever more attention in academic circles. The interdisciplinary nature of EMA research is illustrated by the large number of publications with various co-authors, of which many seem to be involved in one or very few publications only.
- *Conceptual studies dominating:* So far the vast majority of EMA publications is conceptually oriented, proposing different approaches and tools. Although increasing substantially in recent years, only very little empirical work, mostly case studies, has been conducted, and very few established management and accounting theories have been used so far.

In conclusion, the literature review of various kinds of academic and qualified practitioner-oriented publications on EMA shows that the area is developing with a high speed, involving an increasing range of authors, regions and topics. If EMA and sustainability accounting research as a discipline develops similarly to other fields of research, it can be expected that empirical studies will be published increasingly often in the next couple of years. Assuming the current development continues, environmental and sustainability accounting research will be much further matured in the next decade.

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Appendix

Appendix 1: Journals researched for Bibliography building

Journal Name	Topic	Country	Year Started	Researched years
Abacus	Accounting	Australia	1965	1965-2010
Accounting & Business Research	Accounting	UK	1970	1973-2010
Accounting and Finance	Accounting	UK	1960	1979-2010
Accounting Education	Accounting	UK	1992	1992-2010
Accounting Forum	Accounting	UK/USA	1991	1999-2010
Accounting Horizons	Accounting	USA	1987	1987-2010
Accounting Organisations and Society	Accounting	UK	1976	1976-2010
Accounting, accountability and performance	Accounting	Australia	1995	1995-2008
Accounting, Auditing and Accountability Journal	Accounting	Australia	1988	1988-2010
Advances in Accounting	Accounting	USA	1984	2000-2010
Asia-Pacific Journal of Accounting (now called Asia-Pacific Journal of Accounting)	Accounting	Hong-Kong	1994	2000-2010
Asian Review of Accounting	Accounting	Australia	1992	1992-2010
Australian Accounting Review	Accounting	Australia	1991	1998-2010
Behavioural Research in Accounting	Accounting	USA	1989	1989-2010
Business Strategy and the Environment	Environment & Management	UK/Hongkong	1992	1995-2010
Comptabilité, Contrôle, Audit	Accounting	France	1995	1995-2010
Contemporary Accounting Research	Accounting	Canada	1984	1984-2010
Controlling	Accounting	Germany	1988	1989-2010
Corporate Environmental Strategy	Environment & Management	USA	1997	1997-2002
Corporate Social Responsibility and Environmental Management	Environmental Management	UK/Hongkong	2002	2002-2010
Critical Perspectives on Accounting	Accounting	Canada/UK	1990	1990-2010
Eco-Management and Auditing	Environment & Accounting	---(UK)	1993	1993-2001
Ecological Economics	Economics	USA	1989	1989-2010
Environmental Management & Health (Currently published as: Management of Environmental Quality: An International Journal)	Environment & Management	UK	1990	1990-2010
Environmental Quality Management	Environment & Management	USA	1991	1996-2010
Environmental research, engineering and management	Environment & Management	Lithuania	1995	1995-2010
Environmental Values	Environment & Management	UK	1992	1992-2010
Financial Accountability & Management	Accounting	UK/USA	1985	1985-2010
Greener Management International	Environment & Management	UK	1993	1996-2010
Human Ecology Review	Environment & Management	USA	1993	1993-2010
ICFAI Journal of Environmental Economics	Economics	India	2003	2007-2010

Interdisciplinary Environmental Review	Environment & Management	USA	1999	1999-2010
International Journal of Accounting, Auditing and Performance Evaluation	Accounting	Bahrain	2004	2004-2010
International Journal of Production Economics	Economics	Sweden	1976	1976-2010
International Journal of Social Economics	Economics	Canada	1974	1974-2010
International Journal of Sustainable Development and World Ecology	Environment & Management	China	1994	1994-2010
International Journal of Technology Management & Sustainable Development	Environment & Management	UK	2002	2002-2010
International Review of Business Research Papers	Strategy & Management	Australia	2005	2005-2010
International Studies of Management and Organisation	Strategy & Management	USA	1971	1971-2010
Issues in Social & Environmental Accounting	Environment & Accounting	Indonesia	2007	2007-2010
Issues of Accounting Education	Accounting	USA	1983	1983-2010
Journal of Accounting & Public Policy	Accounting	USA	1982	1982-2010
Journal of Accounting and Economics	Accounting	USA	1979	1979-2010
Journal of Accounting and Finance Research (changed to Advances in Accounting, Finance & Economics)	Accounting	USA	1995	2004-2005,2008-2010
Journal of Accounting Auditing and Finance	Accounting	USA	n.a.	no search possible
Journal of Accounting Education	Accounting	USA	1983	1983-2010
Journal of Accounting Research	Accounting	UK	1963	1963-2010
Journal of Applied Business Research	Strategy & Management	USA	1985	1990-2010
Journal of Applied Management Studies	Strategy & Management	n.a.	1992	1992-2000
Journal of Applied Sciences Environmental Management	Environment & Management	Nigeria	1997	2001-2009
Journal of Business & Economics Research	Strategy & Management	USA	2003	2003-2010
Journal of Business Ethics	Strategy & Management	Canada	1982	1982-2010
Journal of business finance and accounting	Accounting	UK	1974	1974-2010
Journal of Cleaner Production	Environment & Accounting	USA	1993	1993-2010
Journal of Corporate Citizenship	Strategy & Management	USA	2004	2004-2010
Journal of Economics Perspectives	Economics	USA	1987	2002-2010
Journal of Education for Business	Strategy & Management	USA	1925	1931-2010
Journal of Environmental Assessment Policy & Management	Strategy & Management	UK	1999	1999-2010
Journal of Environmental Management	Environment & Management	USA	n.a.	1990-2010
Journal of Industrial Ecology	Environment & Management	USA	1997	1997-2010
Journal of Pacific Studies	General	Fiji	n.a.	1978-2008
Journal of the Asia Pacific Centre for Environmental Accountability	Environmental Accounting	Australia	1995	1995-2009

Journal of World Business	Strategy & Management	USA	1966	1997-2010
La revue française de gestion	Strategy & Management	France	1975	2002-2010
Law and Policy in International Business (now Georgetown Journal of International Law)	Law	USA	1968	no search possible
Management Accounting Research	Accounting	UK	1990	1990-2010
Management et avenir	Strategy & Management	France	2004	2004-2010
Management of Environmental Quality: An International Journal (formerly environmental mangement and health)	Environment & Management	UK	1990	1990-2010
Managerial Auditing Journal	Accounting	Australia	1986	1986-2010
Managerial Finance	Finance	USA	1975	1975-2010
Pacific Accounting Review	Accounting	New-Zealand	1988	1997-2010 (not 1998)
Pollution Prevention Review (Pollution Prevention Review is discontinued. It has merged with Environmental Quality Management)	Environment & Management	USA	n.a.	no search possible
Public Money & Management	Strategy & Management	UK	1980	1988-2010
Qualitative Research in Accounting & Management	Accounting	New-Zealand/Australia	2004	2004-2010
Review of Accounting Studies	Accounting	USA	1996	1996-2010
Review of Business Research	Strategy & Management	USA	2000	2008-2010
Revue de l'Organisation Responsable	Environment & Management	France	2006	2006-2010
Social and Environmental Accounting	Environmental Accounting	UK	1981	1993-2010
Spanish Journal of Finance and Accounting (Revista Espanola de Financiacion y Contabilidad)	Accounting	Spain	1972	1972-2010
Sustainability Accounting, Management and Policy Journal	Environment & Accounting	Australia	2010	2010
The Accounting Review	Accounting	USA	1926	1926-2010
The British Accounting Review	Accounting	UK	1974	1988-2010
The European Accounting Review	Accounting	Europe	1992	1992-2010
the International Journal of Accounting	Accounting	USA	1965	1965-2010
The International Journal of Environmental Cultural Economic and Social Sustainability	Economics	Australia/USA	n.a.	2005-2010
Theoretical and Applied Economics	Economics	Romania	1994	2003-2010
Vadyby Management	Strategy & Management	Lithuania	n.a.	no search possible
Zeitschrift für Controlling & Management	Accounting	Germany	1956	2000-2010

Appendix 2: Document numbers

Year	All documents	Journal Papers
1973	1	0
1974	1	0
1975	0	0
1976	1	1
1977	1	1
1978	1	0
1979	0	0
1980	0	0
1981	0	0
1982	0	0
1983	0	0
1984	0	0
1985	0	0
1986	0	0
1987	0	0
1988	0	0
1989	3	0
1990	3	0
1991	11	7
1992	22	10
1993	13	4
1994	18	10
1995	39	22
1996	32	18
1997	43	21
1998	42	12
1999	35	12
2000	42	26
2001	44	25
2002	52	16
2003	43	18
2004	24	16
2005	44	18
2006	70	31
2007	34	17
2008	55	24
2009	37	20
2010	55	41
TOTAL	766	371