# Sustainability in Business Process Management Research – a Literature Review

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## ABSTRACT

Sustainability and business process management (BPM) are both on today's IS research agenda. BPM on the one hand is even seen as one of the core aspects of the discipline. Sustainability on the other hand is a practical problem for business managers around the globe. In this paper we investigate if and how aspects of this trend towards more sustainable enterprises have been adopted and incorporated into current BPM research. We do so in form of a structured literature review. This literature review should help to discuss if today's BPM research provides the right tools and methods to green the underlying business activities or if it is rather embracing sustainability only on a descriptive/argumentative level without true incorporation into its methodological foundations. Based on the literature review the paper closes with some ideas for a future research agenda at the intersection of BPM and sustainability.

## Keywords

Sustainability, BPM, Green BPM, Green IT, Green IS.

## INTRODUCTION

The global trend towards more sustainable business practices is unbroken and likely to even accelerate in the coming years. Recent studies show that decision makers' attitudes towards sustainability are changing from cost factor to being an integral strategic rationale (Accenture 2011; Deloitte 2012; Lacy et al. 2010). Within the IS discipline this trend has been recognised and sustainability is still a growing topic within the community (Elliot 2011; Schmidt et al. 2009; Watson et al. 2010). Business process management (BPM) at the very core of the IS discipline (Houy et al. 2011) – ever since business process engineering has taken centre stage (Baskerville and Myers 2009) – should reflect this trend towards greener business practices.

Although a plethora of methods for modelling business processes has been developed and deployed in research and practice (Becker et al. 2010), there seems to be no widely accepted method, approach or toolbox for sustainable BPM as a whole. Therefore, the aim of this paper is to investigate how strongly the topic of sustainability is reflected in today's BPM research literature.

To answer this question, this paper is structured as follows. First we provide compact background information on BPM and sustainability in the first section. Based on this we present our approach for a structured literature review. This review starts with the selection of keywords and the publication outlets to be searched in. In the following the search itself is performed. The found papers are classified into different categories and shortly put into context. The paper closes with suggesting some ideas for a future research agenda and a conclusion.

## BACKGROUND

### Business Process Management (BPM)

Large enterprises, mid-sized and small companies alike are delivering value through their business processes. Out of the Massachusetts Institute of Technology's (MIT) research programme *Management in the 1990s*, the distinct concept of business process reengineering (BPR) emerged as a way to look specifically at those chains of activity. BPR promised to improve

companies' performance by a radical, top-down enforced change based on a process-oriented rethinking of a company (Peppard and Fitzgerald 1997). Over time it became evident that radical change initiatives as prescribed by the original concept often fail, especially when critical factors such as teamwork and culture, quality management, participative structures, change management, information systems, and project management are neglected (Ahmad et al. 2007). Nonetheless, BPR and the complementary trend of Total Quality Management (TQM), which has a focus on process improvement but is rather incremental, lead to the emergence of today's distinct field of BPM (Becker et al. 2010).

BPM can be viewed from either a pure IT-perspective or be understood as a holistic management practice (Rosemann and de Bruin 2005). Due to the bandwidth between these two understandings, there is no shortness of different definitions for the term BPM (Lee and Dale 1998). For the purpose of this paper we follow a more inclusive understanding of BPM as a way of thinking, shaping, designing and managing organisations through their activity chains (processes). This inclusive understanding also allows subsuming more technical aspects into BPM.

## Sustainability

Twenty-five years ago the United Nation's World Commission on Environment and Development (WCED) applied the concept of sustainability holistically on the further development of humankind: "Humanity has the ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs." (WCED (World Commission on Environment and Development) 1987)

After that statement, it took most parts of the business community some time to recognize the issues and challenges in full. Recently, studies found that managers' started to incorporate sustainability into their core strategic thinking rather than seeing it as being of minor importance (Accenture 2011; Lacy et al. 2010). This is especially true for the generally innovation-friendly IS/IT community: the trend of Green IT made sustainability a premiere subject for its decision makers. Although IT consumes resources, its intelligent use offers the major opportunity to transform organisations and societies towards more sustainable and energy-saving behaviour (Boehm et al. 2011; Ozturk et al. 2011; Stolze, Rah, et al. 2011). Nonetheless, it took IS researchers some time to follow their counterparts from other disciplines. Even these days the IS perspective is still not reflected as it should be within the research activities regarding sustainability (Melville 2010).

Having in mind that the quality of the environment is not immediately affected by technological artifacts per-se but by human behaviour (Elliot 2011), technology is a means to an end that can facilitate and support changed behaviour. It should go hand in hand with on-the-job training towards sustainability (Stolze, Boehm, et al. 2011) and the thoughtful design of the chained activities performed by humans and machines (Ozturk et al. 2011) – also known as BPM. Thereby, BPM could be a tool to help managers around the globe to tackle questions of sustainability by changing the way activities are performed. Therefore, researchers should not only solve (theoretical) knowledge problems but offer innovative, relevant solutions to those practical problems (Wieringa 2010) at the intersection of BPM and sustainability.

## LITERATURE SEARCH

### Study Design

To investigate the existence of a widely accepted method, approach or toolbox for sustainable BPM as a whole, we regard a structured examination of published literature as being suitable (see also the discussion about the informing gap at (Gill and Bhattacherjee 2009a)). We chose to conduct a structured literature review to investigate how strongly the topic of sustainability is reflected in today's BPM research and to derive suggestions for future research. To make the literature search process as transparent as it should be (vom Brocke et al. 2009), we explain how we defined scope and search strategy for our literature review in the following.

The scope of a literature review can be defined by subject, period covered and publication outlets searched as boundaries (Webster and Watson 2002). The subject of our review is sustainability in the business process management area. Since questions of sustainability have also been discussed under the term Green IT (Boehm et al. 2011), this term should be included in the search as well. Therefore, our first search terms were 'sustainability', 'sustainable', 'business process', 'business process management' and 'green IT'. We decided to add 'green IS' as a distinct term, because some authors use it to differentiate between the development and use of information systems for sustainability purposes ('green IS') on the one hand, and more energy consumption-concerned research ('green IT') on the other hand (Jenkin et al. 2011). Regarding the time period covered we chose to include only recent research from 2006 till mid-2011 to reflect the current state in the field.

A difficult decision alike is to choose in which publishing outlets to search. On the one hand, the more outlets are included, the more published research could be found. On the other hand, a focus on the leading journals facilitates the finding of con-

tributions of a higher quality as well as the major ones in a field (Webster and Watson 2002). In this paper we decided to take a broad view by searching many outlets from the inclusive so-called WKWI list (WKWI 2008) which includes 118 journals and 58 conferences from the international, European and German IS discipline. All international top tier journals found in the *AIS Senior Scholar's Basket of Six* are included in this list. Thereby, this list can provide a comprehensive guide to global IS research outlets.

**Performing the search**

To do a complete as possible search within the above chosen boundaries, we decided to search in as many fields or 'bites' of information as possible. This translates usually into title, abstract and full text. In case of non-English journals or conferences the search terms have been translated into the language of that outlet.

Early in the search process it became evident that a plethora of articles including the terms 'business process' or 'business process management' exists. Therefore, we only included articles with a connection to sustainability or Green IS/IT in our initial result set. Our initial result set contains of 101 articles that have been identified to be potentially relevant to our research quest. Out of these 101 articles, 41 have been published in journals (Table 1) and 60 at conferences (Table 2).

| Journal | Volume: Issue | Title | Green IT | Green IS | Sustain-ability | sustain-able | business process | BPM |
|---|---|---|---|---|---|---|---|---|
| Australasian Journal of Information Systems (AJIS) | 16:2 | Green business process management | | | | | x | x |
| | 16:2 | Simulation modelling and strategic change | | | x | x | x | |
| | 16:2 | The greening of organisational organisational IT | x | | x | | | |
| | 16:2 | Web 2.0 to wicked climate change problems | x | x | x | | x | |
| | 17:1 | An Institutional Perspective on the Adoption of Green IS & IT | x | x | x | x | x | |
| | 17:1 | Examining the contribution of Green IT to the objectives of IT departments | x | | x | | | |
| | 17:1 | How do Australian Small and Medium Enterprises Communicate their Environmental Improvement Activities Online | x | x | | x | x | |
| | 17:1 | Impact of Pressure for Environmental Sustainability on Grid Assimilation | x | | x | x | | |
| | 17:1 | The Role of IT Service Management in Green IT | x | | x | x | x | |
| Communications of the Association of Information Systems (CAIS) | 27:1 | Green IS: Concepts and Issues for Information Systems Research | x | x | x | | | |
| HMD - Praxis der Wirtschafts-informatik | 274 | Erweiterter IT-Wertbeitrag durch Green-Business | x | | x | | x | x |
| | 274 | Green Computing & Sustainability | x | | x | | x | |
| | 274 | Green IT im Rahmen eines nachhaltigen Informationsmana-gements | x | | x | | x | |
| IEEE Computer | 42:1 | Green Introspection | x | | x | | | |
| | 42:5 | The Road to Greener IT Pestures | x | | x | | | |
| | 43:3 | Trading in Green IT | x | | x | | | |
| IEEE Internet Computing | 13:4 | Green IT More Than a Three Percent Solution? | x | | x | x | | |
| IEEE Pervasive Computing | 8:1 | Enviromental Sustainability | | | x | x | | |
| | 8:2 | How Green is Green | | | x | x | | |
| Journal of Enter-prise Information Management | 22:5 | Sustainability – a new dimension in information systems evaluation | | | x | x | | |
| Journal of the Association of Information Systems (JAIS) | 10:4 | Resource-Based Framework for IS-Reearch: Knowledge Firms and Sustainabibilty in Knowledge Markets | | | x | x | | |
| Management Information Systems Quarterly (MISQ) | 34:1 | Information Systems and Environmentally Sustainable Development | x | x | x | x | x | |
| | 34:1 | Information Systems Innovation for Enviromental Sustaina-bility | | x | x | x | x | |

| Journal | Issue | Title | Green IT | Green IS | Sustain-ability | sustain-able | business process | BPM |
|---|---|---|---|---|---|---|---|---|
| MIT Sloan Management Review (MIT SMR) | 50:1 | The Green Capital advantage | | | x | x | | |
| | 51:1 | 8 Reasons (You Never Thought Of) That Sustainability Will Change Management | | | x | | | |
| | 51:1 | The Business of Sustainability: What It Means to Managers Now | | | x | | | |
| | 51:1 | The Mini-Cases: 5 Companies, 5 Strategies, 5 Transformations | | | x | x | | |
| | 51:1 | The evolution of sustainability | | | x | x | | |
| | 52:2 | First Look: The Second Annual Sustainability & Innovation Survey | | | x | x | | |
| | 52:3 | New Sustainability Study: The 'Embracers' Seize Advantage | | | x | | | |
| The Journal of Strategic Information Systems (JSIS) | 18:4 | Managing sustainability with the support of business intelligence | | | x | | | |
| | 20:1 | Compliance with institutional imperatives on environmental sustainability | x | x | x | x | x | |
| | 20:1 | Designing IT systems according to environmental settings | x | | x | x | | |
| | 20:1 | From green to sustainability | x | | x | x | x | |
| | 20:1 | Green projects | | x | x | x | | |
| | 20:1 | Information technology as a change actant in sustainability innovation. | x | | x | x | | |
| | 20:1 | Integrating the smartphone into a sound environmental information systems. strategy | | | x | x | x | |
| | 20:1 | Integrative framework for assessing firms' potential to undertake Green IT initiatives via virtualization | x | x | x | x | x | |
| Wirtschafts-informatik (WI) | 50:4 | Warum Green IT heute nich ausreicht | x | | x | | x | x |
| | 51:4 | Die Verantwortung der Wirtschaftsinformatik für unseren Planeten | | | x | x | x | x |
| | 51:5 | Nachhaltiges Informationsmanagement | x | | | x | x | x |
| **Total** | | **60** | **23** | **9** | **38** | **25** | **18** | **5** |

**Table 1. Articles found in journals**

| Conference | Year | Title | Green IT | Green IS | Sustain-ability | sustain-able | business process | BPM |
|---|---|---|---|---|---|---|---|---|
| Americas Conference on Information Systems (AMCIS) | 2009 | Sustainability in Information Systems: Assortment of Current Practices in IS Organizations | x | | x | x | | |
| | 2009 | IS Solution for the Global Environmental Challenge: An Australian Initiative | x | x | | | x | |
| | 2009 | IT Strategy and Economic Sustainability: Formulating a 21st Century Paradigm | | | x | x | | |
| | 2009 | Green IT: An Implementation Framework | x | x | x | x | x | |
| | 2010 | Unpacking Green IT: A Review of the Existing Literature | x | x | x | x | x | |
| | 2010 | Developing and Justifying Energy Conservation Measures: Green IT under Construction | x | x | x | x | | |
| | 2010 | Reducing Environmental Impact in Procurement by Integrating Material Parameters in Information Systems: The Example of Apple Sourcing | x | x | x | | | |
| | 2010 | Green/Sustainable IT/IS: Concepts and Cases | x | x | x | x | | |
| | 2010 | Identifying Green IT Leaders with Financial and Environmental Performance Indicators | x | | | x | | |
| | 2010 | Organizational Green IT: It seems the bottom line rules | x | | x | | | |
| | 2010 | Predictors of Green IT Adoption: Implications from an Empirical Investigation | x | x | x | x | | |
| | 2010 | From Green IT to Sustainable Innovation | x | x | x | x | | |
| Australasian Conference on Information Systems | 2008 | GITAM: A Model for the Adoption of Green IT | x | | x | x | x | |
| | 2008 | E-Readiness to G-Readiness: Developing a Green Information Technology Readiness Framework | x | | x | x | | |
| | 2009 | Knowledge Sharing by Organisations in Sustainable Development Projects | | | x | x | | |

| Conference | Year | Title | | | | | | |
|---|---|---|---|---|---|---|---|---|
| (ACIS) | 2009 | The Reach And Richness Of Green IT: A Principal Component Analysis | x | | | | | |
| | 2010 | Antecedents to Greening Data Centres: A Conceptual Framework and Exploratory Case Study | x | x | x | x | | |
| | 2010 | Assessing the Carbon Footprint of Paper vs. Electronic Invoicing | x | x | x | x | x | |
| Business Process Management (BPM) | 2010 | Controlling of Dynamic Enterprises by Indicators - A Foundational Approach | | | x | x | | |
| | 2010 | Sustainability Performance Measurement - The Case of Ethiopian Airlines | | | x | x | | |
| | 2010 | Process Performance Management as a Basic Concept for Sustainable Business Process Management - Empirical Investigation and Research Agenda | | | x | x | x | x |
| | 2010 | What Is Sustainability in Business Process Management? A Theoretical Framework and Its Application in the Public Sector of Ethiopia | | | x | x | x | x |
| | 2010 | Towards Green BPM - Sustainability and Resource Efficiency through Business Process Management | x | | x | x | x | x |
| | 2010 | Measuring the Carbon Footprint of Business Processes | x | | x | x | x | x |
| Conference on Information and Knowledge Management (CIKM) | 2010 | A decision support system for green data centers | x | | x | x | | |
| European Conference on Information Systems (ECIS) | 2009 | Environmental Responsability and Green IT: an institutional Perspective | x | | | | x | |
| | 2009 | Green IT: Everything starts from the  software | x | x | x | x | x | |
| | 2010 | The Impact of MIS Software on IT Energy Consumption | x | | x | | | |
| | 2010 | Power Control to the People? Private Consumers' Acceptance of Smart Meters | x | | | | | |
| | 2010 | Influence of Green IT on Consumers' Buying Behavior of Personal Computers: Implications from a Conjoint Analysis | x | | x | | | |
| | 2010 | Grid Technology as Green IT Strategy? Empirical Results from the Financial Services Industry | x | | | x | x | |
| Hawaii International Conference on System Science (HICSS) | 2009 | Towards a Procedural Model for Sustainable Information Systems Management | x | | x | x | | |
| | 2010 | Design and Evaluation of a Social Visualization Aimed at Encouraging Sustainable Behavior | | | x | x | | |
| | 2010 | Information Theory Perspective on Modeling Sustainability | | | x | x | | |
| | 2010 | The Green IT Practices of Nokia, Samsung, Sony, and Sony Ericsson: Content Analysis Approach | x | | x | x | x | |
| | 2011 | Electronic Transportation Marketplaces: How Can Green-IS Help to Promote Sustainable Logistics? | | x | | x | | |
| | 2011 | An Introduction to the Green IT Balanced Scorecard as a Strategic IT Management System | x | | | | | |
| International Conference on Electronic Business (ICEB) | 2009 | RFID AS GREEN IT: LESSONS LEARNED FROM CASE STUDIES | x | | x | | | |
| International Conference on Information Systems (ICIS) | 2009 | Organizational Adoption of Green IS & IT: An Institutional Perspective | x | x | x | x | x | |
| | 2009 | IT and Eco-sustainability: Developing and Validating a Green IT Readiness Model | x | | x | | x | |
| | 2009 | Sustainable Notebooks: Who Carries the Cost? | | | x | x | | |
| | 2009 | How Green is my Outsourcer - Environmental Responsibility in Global IT Outsourcing | | | x | | | |
| | 2010 | Green Information Technology, Energy Efficiency, and Profits: Evidence from an Emerging Economy | x | x | x | x | x | |
| | 2010 | CORPORATE ECOLOGICAL RESPONSIVENESS, ENVIRONMENTAL AMBIDEXTERITY AND IT-ENABLED ENVIRONMENTAL SUSTAINABILITY STRATEGY | x | x | x | x | x | |
| International Conference on Service Oriented Computing | 2010 | Carbon-Aware Business Process Design in Abnoba | | | x | | x | x |
| | 2010 | Business Process Improvement in Abnoba | | | x | | x | x |
| | 2010 | Creating Environmental Awareness in Service Oriented Software Engi- | | | x | x | x | |

| Conference | Year | Title | | | | | | |
|---|---|---|---|---|---|---|---|---|
| (ICSOC) | | neering | | | | | | |
| | 2010 | Towards Green Business Process Reengineering | x | | x | x | x | |
| | 2010 | An Energy Aware Context Model for Green IT Service Centers | x | | | | | |
| Multikonfer-enz der Wirtschaftsin formatik (MKWI) | 2010 | Betriebliche Umweltinformationssysteme | | | x | x | | |
| | 2010 | A systematic review of sustaible supply chain management research | x | | x | x | | |
| | 2010 | Sustainable Supply Chain Management in Recyclingnetzwerken der Elektro- und Eletronikindustrie | | | x | x | x | |
| Pacicfic Asia Conference on Infor-mation Systems (PACIS) | 2008 | Environmentally Sustainable ICT: Developing Corporate Capabilities and an Industry-relevant IS Research Agenda | x | | x | x | | |
| | 2009 | Does Green IT Matter? Analysis of the Relationship between Green IT and Grid Technology from a Resource-Based View Perspective | x | | x | x | | |
| | 2010 | Seeking the "Green" in "Green IS": A Spirit, Practice and Impact Per-spective | x | x | x | x | x | |
| | 2010 | An Explorative Study for Business Models for Sustainability | x | | x | x | | |
| | 2010 | The Challenge of Energy Management - Status-Quo and Perspectives for Reference Models | x | | x | x | | |
| Wirtschaftsin formatik (WIco) | 2007 | Modellbasierter Entwurf strukturanaloger Architekturen auf Basis der Positionierung von Graphen | | | x | | x | |
| | 2011 | Hybride Leistungsbündel für energieeffiziente Planung, Steuerung und Betrieb von IT-Infrastuktur | x | | x | | x | |
| | 2011 | Development and Simulation of a Balanced Scorecard for Sustainable Supply Chain Management - A System Dynamics Approach | | | x | x | x | |
| **Total** | | **60** | **42** | **16** | **51** | **44** | **6** | **24** |

**Table 2. Articles found in conference proceedings**

Please note, the same article could be found for different keywords. Therefore, the numbers cannot just be added up to get the total. This was done manually upon completion of the search. Furthermore, not all articles explicitly had 'business process (management)' in their content but were included after a review of their content.

## CLASSIFICATION AND INTERPRETATION OF RESULTS

### Looking at time and geography

As first step in our classification of found articles we analyzed their publication year. Before 2009 surprisingly little attention was given to sustainability in BPM research, before the topic exploded in 2010 (Figure 1).
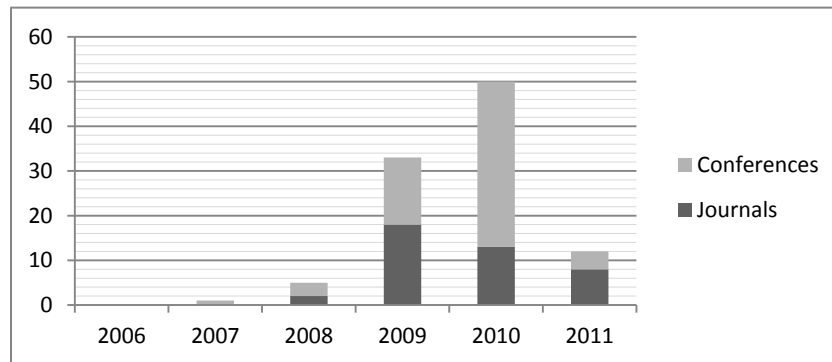


**Figure 1. Identified articles per year**

In early 2010, an article in MISQ called for more attention towards sustainability from the IS community (Melville 2010). That might have led to the peak in conference publications in that year as conferences usually have shorter turn-around times from submission till publication when compared to journals. Surprisingly, in 2009 more articles were found in journals than in conference proceedings. For the time analyzed in 2011 the number of relevant articles seems to decrease again. This could have two reasons: first, the topic is not perceived as "hot" anymore – thereby being on the dipping side of a typical IS fashion wave (Baskerville and Myers 2009). Second, for a new topic the theoretical foundations have to be laid at the beginning. Those foundations often get discussed heavily – so many publications are written on that specific topic. Later, when only

incremental progress can be reported, the acceptance of papers gets harder – especially in journals. That might also be an explanation why the number of articles in journals declined.

The second analysis we performed was about the geographical distribution of authorship. We based the assessment of geographical original on the institutional affiliation of the authors and not on the outlet or nationality of authors. Thereby it is possible to examine how strong the topic of sustainability is driven from specific countries. There are two options to assess geographical origin for this purpose: One option is to count on how many papers authors from a country have been involved. In this case a paper X with 3 authors form country A would count only once for country A whilst a paper Y with 2 authors, one form A and one from B, would count once for A and once for B. The other option is to count each author separately. In this case paper X would count as thrice for country A whilst nothing changes for paper Y in our example.

Applying both options yields interesting results: most papers have at least one author from the United States, but counting single authors most come from Germany. Independently, Australia, Canada, the UK and Italy follow afterwards (Figure 2).
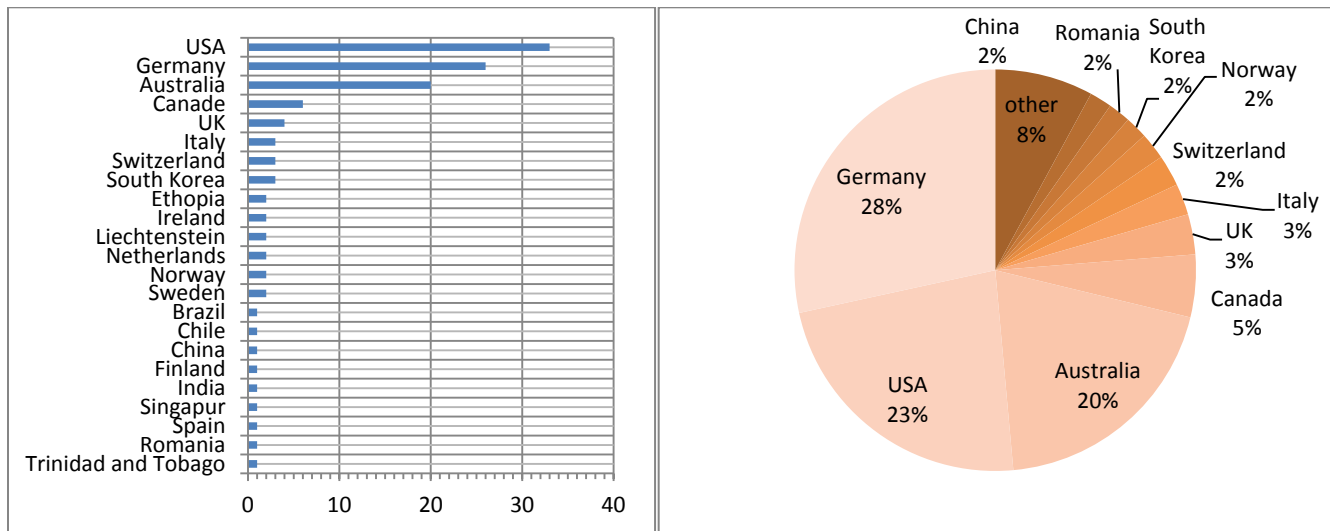


**Figure 2. Results of the geographical analysis (option 1 left, option 2 right)**

Examining the geographical distribution further one can notice that most articles have European authorship followed by North American one. Australia is quite strong before Asia, Latin America and Africa. Nonetheless, the chosen scope of outlets could be considered biased towards European and especially German authorship. However, the underrepresentation of research by authors outside of North America and Europe still should be a wakeup call for the global IS community to encourage participation and become more inclusive. Another interesting point is to think about different cultures, traditions and needs regarding collaboration and assignment of authorship. For example, a researcher from Liechtenstein has only access to a limited domestic community whilst a US researcher finds a huge and differentiated IS community inside his/her country. When taking a closer look on the cross-border cooperation patterns of the top three countries, it becomes clear that US researchers are – although having a huge domestic community to tap in – could be interpreted as being most open to international cooperation. Over one fifth of all articles with at least one US author are co-authored by at least one author from another country. Interestingly, the articles with Australian authorship were Australian only, which is quite surprising considering the huge share of articles in our initial result set.

**Making sense of the content**

To understand the current state of the art at the intersection of BPM and sustainability we divided our initial result set into different categories based on how strong both topics are related within a paper. For this we use three categories:

    A    Articles with a clear focus on business process management combined with sustainability and/or Green IT.
    B    Articles showing some connection between BPM and sustainability
    C    Articles only mentioning sustainability, Green IT and/or BPM

As a result of this assignment, out of the 101 articles 8 could be seen in category A, 34 in category B and the majority of 59 only in category C. Out of the 8 articles in categories A, 4 have been accepted at the BPM conference 2010, 3 at the International Conference on Service Oriented Computing 2010 and the least one for the Australasian Journal of Information Sys-

tems. Therefore, it can be assumed that integrated, holistic approaches towards sustainable BPM are limited in numbers of approaches and places to be discussed.

Digging deeper into the content, different labels have been attached to address sustainability questions in BPM: „Green Business Process Management" (Ghose et al. 2009; Hoesch-Klohe and Ghose 2010; Houy et al. 2010), „Green Business Process Reengineering" (Nowak et al. 2011) und „Sustainable Business Process Management" (Cleven et al. 2010). Independent of the label there seems to be consensus about the fact that sustainable practices for BPM need to consider all relevant stakeholders and thereby facilitating corporate sustainability (Hailemariam and vom Brocke 2010; Houy et al. 2010). The authors of the label Green Process Management stress the bidirectional dependence between Green IT (setting requirement for BPM) and BPM (being enabler as well as user of IT) which create complex relations with multiple variables between the two areas of consideration (Ghose et al. 2009; Houy et al. 2010; Nowak et al. 2011).

One concrete example of a BPM method incorporating sustainability aspects is the activity-based emission (ABE) analysis (Recker et al. 2010). The ABE analysis extends the concept of activity-based costing with indicators for resource consumption and (carbon) emissions. Thereby, each activity could be checked for its individual impact on the environmental bottomline of an enterprise. Similarly, process performance measurement is presented as suitable for an extended measurement and improvement of sustainability (Cleven et al. 2010). All this is based on measuring the ecological impact. For this indicators are needed (Nowak et al. 2011) and could be in practice annotations on business process models (Hoesch-Klohe and Ghose 2010).

## POTENTIAL FUTURE RESEARCH AGENDA

Having analysed the literature, the fields of sustainability and BPM offer many research opportunities at their intersection for at least two reasons: First, there aren't many works that integrate both topics yet as our study has shown. It is a vast field of research opportunity (see also (Melville 2010)). Second, sustainability concerns in companies grow, so most likely there will be practical demand for problem-solving artifacts. In the following we would like to present a few points for a future research agenda for this highly relevant topic.

**Develop standardized means to integrate sustainability into BPM.** Business process management usually uses established and/or standardized modelling languages. The languages, such as BPMN, UML activity diagrams, petri-nets, flow charts or EPCs, are on the one hand an enabler for process designer to express his/her thoughts, but on the other hand they also limit the space for expression by a limited number of elements: So how could these languages being extended to integrate questions of sustainability? Do we need dedicated and standardized elements or attributes for sustainability? How much standardization is needed to keep results comparable? How could these extensions and standards be developed? Besides languages: Which frameworks used to structure BPM endeavours need to be extended in the same way?

**Create inter-disciplinary and international discussion spaces.** Due to the inter-disciplinary nature of sustainability research, the IS community as one of the main drivers behind BPM research should actively seek for an inter-disciplinary exchange of ideas. So far many conferences are only attended and visible by always the same community. So, how can we develop and implement new concepts for idea exchange with other communities? How do we foster international collaboration? What needs to be done to overcome stereotypes such as US researchers being not very open to international cooperation although our study results indicate they are very much?

**Agree on a common brand name.** As simple as this point sounds, it is of major importance for the future relevance and success of research in this field. Without having a catchy but accurate name, an idea can hardly be "sold" to practitioners, donors, and those giving research grants. At the same time an umbrella term might also make researchers realize they work on the same topic, just under different titles so far. In this sense, a common brand name would stimulate the community inside and at the same time sharpen its image to the outside. What would be the right name? What is the umbrella term that does not exclude parts of the community?

**Relevance.** Although our time analysis showed a peak in 2009 for published research, the practical relevance of sustainability is still increasing. As mentioned in the beginning of this paper, managers only incorporate sustainability as a concept now into their strategic thinking. So questions would be: Are we as IS researchers ahead of companies in our thinking? Or is our research triggered not by relevance on its own, but by "steered" relevance through (often public) funding or trends in society? What does this mean in terms of innovation for our discipline? Or did we just miss to give it a catchy name? These questions around relevance are not exclusively tied to sustainability and BPM research but could be relevant for the IS discipline as a whole (see also the discussion around the so-called informing gap (Gill and Bhattacherjee 2009a, 2009b; Myers and Baskerville 2009)).

**CONCLUSION**

In this paper we examined how strongly the topic of sustainability is reflected in today's BPM research. To answer this question, we introduced the concepts of BPM and sustainability before conducting a structured literature study. The result set was first analysed for time of publication and geographical authorship. This already yielded the interesting result of US researchers being pretty open to international cooperation whilst sometimes their image is different. Then the found articles were categorized depending on how strong sustainability aspects were integrated into BPM concepts. We found BPM research is largely touching sustainability only so far. In the future, a real shift towards green/sustainable business processes management might be desirable. For this we drafted a short research agenda.

We are also aware of the limitations of our study: first, the outlets are certainly biased towards European and especially German ones. We also did not include practitioners' reports or working papers (e.g. publications on the Sprouts platform of the AIS by the SIGGreen). Second, the time frame might be too short. Third, different search terms might have yielded more results. Thereby, by no means our study can be claimed exhaustive. Nonetheless, we believe our paper can serve as a starting point for fruitful discussions and as a guide for future research.

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