

**Green Procurement in the Private Sector:
A State of Art Review between 1996 and 2013**

Abstract

The purpose of this paper is to identify the main themes of Green Procurement (GP) in the private sector through a literature review of papers published between 1996 and 2013 and to develop some future research directions. GP research has garnered interest from academics and industry alike. This is demonstrated by the increasing number of academic papers published in recent years. This literature review builds on the three themes in the adoption of GP identified from the literature: 1) the motivation and drivers for the implementation of GP; 2) barriers to the implementation of GP; 3) the performance impacts of the adoption of GP. Given that there are distinctive features of the private sector, compared to the public sector, this analysis focuses on GP in the private sector. The approach to GP holds important implications for managers, by directing limited resources towards projects which intersect both environmental performance and economic performance. The article discusses interesting findings, develops a conceptual framework of GP and suggests a number of directions for future research.

Keywords: Green Procurement; Drivers; Barriers; Performances; Literature Review

1. Introduction

1.1. Relevance of Green Procurement

Over the years the purchasing function has evolved towards being more strategic due to a growing trend for focusing on core activities while outsourcing most of the non-core ones (Giunipero *et al.*, 2006; Lawson *et al.*, 2009). Such an approach is shifting a large part of the manufacturing activities outside the company boundary and the purchasing function contributes to an increasing impact on the natural environment (Zsidisin and Siferd, 2001). Purchasing serves as a boundary-spanning function within firms and provides an advantageous position based upon which a firm can coordinate a chain of activities to appraise its suppliers from an environmental point of view so as to create conditions for the subsequent activities being green (Enarsson, 1998).

The procurement function opens up an important opportunity for integrating environmental aspects into all processes and all units of a company, and contributes to a reduction of the environmental impact caused by business actions. Purchasing therefore is potentially a more powerful agent of change than any other corporate function (Green *et al.*, 1998; Zsidisin and Hendrick, 1998; Preuss, 2001).

In recent years, interest in the cross-disciplinary area of GP research (used interchangeably with green purchasing, environmental purchasing, sustainable sourcing and supply management) continue to grow in both academia and industry. This is driven mainly by environmental and financial performance in response to competitive, regulatory and community pressures. However, it appears that environmental commitment could be not only a result of regulatory compliance but a source of competitive advantage for a firm (Carter *et al.*, 2000).

Various researchers examine the positive effect of green and environmental purchasing as a possible instrument that reduces sources of waste and promotes recycling and other environmental benefits (Handfield *et al.*, 1997; Carter and Carter, 1998, 2000; Bowen *et al.*, 2001a, b; Min and Galle, 2001; Klassen and Vachon, 2003; Guenther *et al.*, 2010). As procurement processes towards a more green approach, it contains the potential for integrating environmental aspects into a company's decision making; GP may allow senior management to cope with their environmental responsibilities as far as the impact on the whole supply chain is concerned (Guenther *et al.*, 2010). For example, the effect might be greater in the case that one of the leading companies within a supply chain applies GP, thus influencing its suppliers. In

the process of increasing their own environmental responsibility, leading firms can also raise the environmental activities of other companies within their supply chains.

1.2. Definitions of Green Procurement

Different authors have provided several definitions of GP and have used different terminologies, such as environmental procurement or purchasing. Furthermore, while the notion of “green purchasing” or “GP” is circulating, nobody has outlined it in depth and specified the notion of “greenness” as related to suppliers (Nagel, 2003).

In a recent work, Large and Thomsen, (2011) define environmental or green purchasing as an integration of environmental considerations into purchasing policies, programmes, and actions. Green, or environmental purchasing, is the involvement of the purchasing function in supply chain management activities such as life-cycle analysis (LCA) and environment design that facilitates recycling, reuse and resource reduction (Carter and Carter, 1998; Carter *et al.*, 1998).

An holistic definition is presented by Zsidisin and Siferd (2001: 69) as “*Environmental purchasing for an individual firm is the set of purchasing policies held, actions taken, and relationships formed in response to concerns associated with the natural environment. These concerns relate to the acquisition of raw materials, including supplier selection, evaluation and development; suppliers’ operations; inbound distribution; packaging; recycling; reuse; resource reduction; and final disposal of the firm’s products.*”

It can be seen that definitions provided by Zsidisin and Siferd (2001) and Large and Thomsen (2011) are similar, while that of Carter *et al.* (1998) is out of date as it is narrowed down to technical issue such as recycling and LCA. In this study, we adopt Large and Thomsen’s (2011) definition because its expression is simple and less specified therefore leaves more freedom for new themes to emerge.

1.3. Literature reviews on green Supply Chain Management

While there is, in general, abundant literature on various aspects and facets of green management due to growing interest, particularly in the last decade, there are still some areas that need further research. In particular, while abundant literature exists on green supply chain management (SCM), the considerations and evidences specifically related to GP are much less developed. Among the review and conceptual

papers identified in the related search, only five that attempt to review part of the GP literature were found; these are discussed one in turn below to justify why this review has been carried out.

Zsidisin and Siferd's (2001) is the only literature review devoted specifically to GP; it reviews and synthesizes several common themes found in the literature stream and proposes a theoretical direction for future research in environmental purchasing. However, as there has been a surge of research since 2001 and the practice has been fast evolving, it is worthwhile conducting another review regarding the new themes and practices that have emerged on this topic.

Seuring and Müller (2008) offer a literature review on sustainable SCM based on 191 papers and a conceptual framework to summarize the main research in this field, but green purchasing is only a small part of their review.

Carter and Rogers (2008) perform an extensive literature review and use a conceptual theory building approach to propose the concept of sustainability in the field of SCM and demonstrate the relationships between environmental, social and economic performance within an SCM context, but do not touch on other aspects of GP.

A recent review by Sarkis *et al.* (2011) categorizes and reviews green SCM literature under nine broad organizational theories, with special emphasis on the investigation of the adoption, diffusion and outcomes of green supply management practices but, again, procurement is a small part of their review.

Miemczyk *et al.*'s (2012) review focused on the definition and measures of sustainable supply management, including both environmental and social aspects of sustainability. Its scope is broader than ours as it includes both social and environmental aspects and investigates three levels of dyad, chain and network based on 73 publications and a selected list of journals. Our review is more focused and we search more broadly in the databases.

In this study, we have conducted a comprehensive literature review which aims to collect and analyze all relevant papers in the field of GP by means of a structured search of the literature from 1996 to 2013 in order to synthesize the major common themes found in this literature, by proposing a conceptual framework capturing related research, and also proposing a number of future research directions.

2. Research method

This paper seeks to provide a rigorous, critical analysis of the state-of-the-art research into GP. A systematic literature review would seem to be a valid approach, as it is a necessary step in structuring a research field and forms an integral part of any research conducted (Easterby-Smith *et al.*, 2002); and in “providing collective insights through theoretical synthesis into fields and sub-fields” Tranfield *et al.*, 2003: 220). Fink (2005) also argues that a research literature review is a systematic and reproducible design for identifying and evaluating an existing body of scholarly works.

The literature analyzed here comprises peer-reviewed English language papers, which are focused on GP during the time period from 1996 to 2013. This starting point represents the beginning of the debate on GP in the literature (e.g. Lamming and Hampson, 1996; Green *et al.*, 1996). Those articles with a broader focus on green SCM, were only considered if they had a particular focus on GP.

The keywords used for the selection of articles are: “GP”; “Green Purchas*”; “Sustainable Procurement”; “Sustainable Purchas*”; “Ethical Procurement”; “Environmental Procurement”; plus “NOT Public Procurement”, in the title or in the abstract.

Purchas* (purchasing and purchase) has been included as it is used by several authors with a very similar meaning to procurement. Environmental has been included as it is synonymous with green within this analysis. Moreover, given that green management issues are often related to broader themes such as sustainability and ethics, we initially included these two keywords. However, during the progress of our analysis we have focused on articles that were dealing specifically with or had a significant part of them devoted to GP.

Given the specificities and policy implications of green public procurement, and the fact that this topic has already been widely analyzed in the literature, we shall restrict our analysis to GP as carried out in the private sector.

As in Seuring and Müller (2008) major databases were searched, i.e., those provided by major publishers – Scopus, Emerald (www.emeraldinsight.com), Springer (www.springerlink.com) and Ebsco (www.ebsco.com). As we found a great degree of duplication among these major databases, Scopus is the one that we decided to use.

An initial selection was made based on abstracts in order to decide whether or not the whole paper should be included for further analysis. The two overarching inclusion criteria were related to the research methods used and the paper contents. In particular, papers using non-empirical approaches, such as mathematical modelling (as opposed to empirical modelling developed from literature or case studies), were excluded from the review. Also, very highly technical articles on topics such as life-cycle assessment, inventory, reverse logistics, pollution prevention and disassembly were excluded from the review. Such a choice was made because of the managerial focus of this review, which is aimed at looking at strategic and organizational issues related to GP, without analyzing the specific technical tools that can be used.

As a result, the papers selected for the analysis based on the full text were characterized as to their research methods, such as conceptual theory building papers, systematic literature reviews, and papers employing empirical approaches based on surveys, case studies, interviews, and laboratory experiments (Carter and Easton, 2011).

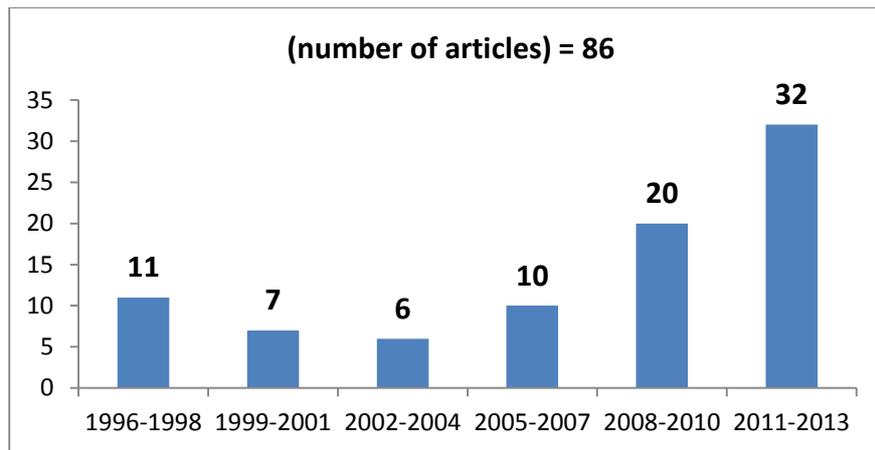
To increase the reliability of the research, the search in the databases and selecting and analysis of papers were carried out by the three researchers/co-authors independently, who then compared notes and reached agreement on the selection and all the coding of papers. Based on this approach, 86 papers were finally identified and subsequently analyzed. The results of the literature review are presented and discussed in the rest of the paper.

3. Descriptive analysis

3.1 Distribution of publications across the period

The time period chosen for searching the publications is from 1996 to 2013 (Fig. 1). This starting point represents the beginning of the debate on GP in the literature (e.g. Green *et al.*, 1996; Lamming and Hampson, 1996). Up to 2007, the number of papers on this topic remained limited to a range of between 2 and 3 per year. A large number of publications were, however, found for the time period between 2008 and 2013. In the last three-year period (2011, 2012 and 2013), there were 32 contributions. Our final search was conducted in late December, 2013.

Fig. 1 Distribution of publications per year across the period studied



The peak in the period between 2008 and 2013 indicates the importance of conducting an up-to-date literature review because the widely cited literature review papers on green SCM by Seuring and Müller (2008) and Walker *et al.* (2008) reviewed papers only up to 2007.

3.2 Distribution of publications across areas/journals period

The 86 articles selected were classified, according to the journals in which they had been published, under four disciplines, namely (Table 1):

- (A) Production, Operations and Supply Chain Management (OM);
- (B) Sustainability, Environment and Quality;
- (C) General Management;
- (D) Marketing.

Table 1 Journals/articles distribution per area

Area/Journal	No. of Articles	Impact Factor 2012
A – Productions, Operations and Supply Chain Management	57	
<i>Decision Sciences (DS)</i>	1	1.484
<i>European Journal of Operational Research (EJOR)</i>	3	2.038
<i>Expert Systems with Applications (ESA)</i>	1	1.854
<i>Production Planning & Control (PPC)</i>	1	0.660
<i>Industrial Management & Data Systems (IMDS)</i>	3	1.674
<i>International Journal of Production Economics (IJPE)</i>	5	2.081
<i>International Journal of Operations & Production Management (IJOPM)</i>	4	1.252
<i>International Journal of Physical Distribution & Logistics Management (IJPDLM)</i>	2	1.826
<i>International Journal of Production Research (IJPR)</i>	5	1.460
<i>Journal of Business Logistics (JBL)</i>	1	2.020
<i>Journal of Manufacturing Technology Management (JMTM)</i>	2	-
<i>Journal of Engineering and Technology Management (JETM)</i>	1	0.967
<i>Journal of Operations Management (JOM)</i>	2	4.400
<i>Journal of Purchasing & Supply Management (ex EJPSM) (JPSM)</i>	11	1.458
<i>Production and Operations Management (POM)</i>	2	1.315
<i>Supply Chain Management: An International Journal (SCM: AIJ)</i>	6	1.684
<i>Journal of Supply Chain Management (JSCM ex IJPMM)</i>	5	3.320
<i>Transportation Research Part E: Logistics and Transportation Review (TRPLTR)</i>	2	2.272
B – Sustainability, Environment and Quality	24	
<i>Business Strategy and the Environment (BSE)</i>	3	3.236
<i>Corporate Social Responsibility and Environmental Management (CSREM)</i>	1	1.690
<i>Greener Management International (GMI)</i>	2	-
<i>Journal of Business Ethics (JBE)</i>	2	1.253
<i>Journal of Cleaner Production (JCP)</i>	13	3.398
<i>Journal of Environmental Management (JEM)</i>	1	3.057
<i>Sustainable Development (SD)</i>	1	1.884
<i>Total Quality Management (TQM)</i>	1	0.894
C – General Management	3	
<i>British Journal of Management (BJM)</i>	1	2.044
<i>Management Research Review (MRR)</i>	2	-
D – Marketing	2	
<i>Industrial Marketing Management (IMM)</i>	2	1.933

In the “Production, Operations and Supply Management” area, there are 57 articles published in 18 different journals, underlying the importance of the issues of green and sustainability in such literature.

In the “Sustainability, Environmental and Quality” area there are 24 articles published in eight different journals – evidence that the debate on environmental issues considers procurement as an important element of a broader approach towards sustainability.

Just three articles published in two journals (*BJM* and *MRR*) were found in the “General Management” area, highlighting that GP is too specific a topic to be normally dealt with in general management journals. There are also two papers published in a business to business marketing journal (*IMM*) which also publishes papers on purchasing and supply management i.e., they are two sides of a coin.

More specifically, in the “Production, Operations and Supply Management” area, the highest number of articles (11) was found in the *JPSM*, six in *SCM: AIJ* and six in the *JSCM*. The mainstream OM journals such as *JOM*, *DS*, *IJPE*, *IJOPM*, *POM*, *IJPR*, *JBL*, *IJPDLM* and *EJOR* have also been captured in the review, showing that the GP topic is widely recognized as important in the OM field.

In the “Sustainability, Environmental and Quality” area, the *JCP* has a relevant number of articles (13) and has the greatest number of papers among the journals identified. This is partially due to a special issue including eight papers devoted to this topic. The others journals have just one or two articles each with the exception of *JBE* which published three.

In order to validate the relevance of these journals, their Impact Factor (IF) is presented (Table 1). Given that the IF is a key performance metric for the ranking of and comparison among journals, it appears that all the journals that are mainly hosting the debate on GP have a very high IF, with the exception of one journal that has no IF.

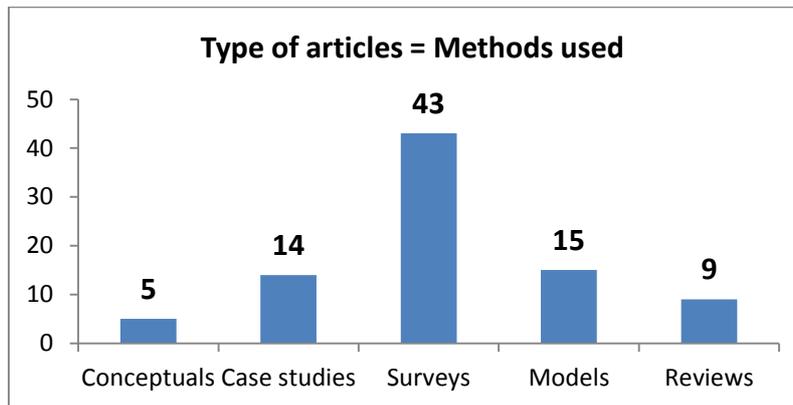
3.3. Distribution according to the research methodologies applied

The 86 articles identified were coded according to their research methodology into five categories, as suggested by Seuring and Müller (2008), with the following results (Fig. 2):

1. Theoretical and conceptual papers (5);

2. Case studies (14);
3. Surveys (43);
4. Models (15); and
5. Literature reviews (9).

Fig. 2 Research methodologies employed



The survey appears as the prevalent research method adopted (half of the contributions), with the questionnaires mainly submitted to procurement managers. The second methodology mostly used is represented by mathematical modelling with 15 papers. Case study type has 14 representations. Nine literature reviews have been published in the area of the green SCM related topics with some part of their analysis specifically related to GP. There are also five theoretical/conceptual articles that aim to develop a conceptual framework and propositions for future empirical tests.

3.4 Distribution of publications across industries/countries

The 86 articles identified were coded based on the industry on which they were focusing and the country of the authors, so as to highlight the areas that appeared to be mostly concerned with GP issues (see Appendix).

From the analysis per industry, it appears that the GP approach is being informed mainly from a manufacturing perspective with the consumer market as the primary concern. There are also articles for the electronics industry, healthcare and furniture. The majority of articles, however, do not target any specific industry but are multi-industry, highlighting the need to look for general evidences that go beyond the specificities of any single industry.

From the analysis of the countries of origin of the papers' authors, there appears to be a predominance from the USA (around 41% of the selected papers) and from the UK (around 17%), particularly during the earlier periods. Around 24% of authors come from China. In recent years, a growing number of German authors have also been writing on the topic. This indicates that the research community is widening geographically and is directly involving scholars from those areas in the world – especially China – where an increasing share of the world's production is being carried out.

4. Thematic findings

GP has evolved into one of the emerging environmental management topics in the area of SCM research. GP, or green purchasing, is linked to the product and process aspects of supply management, including “eco-labels, the avoidance of environmentally relevant substances, energy use, use of recycled materials, product mass, re-usability of some parts, recyclability, the use of environmental management systems and the application of Design for the Environment (DfE) or life cycle assessment (LCA)” (Nagel, 2003: 14). Thus, a green supplier is expected not only to achieve environmental compliance but also to undertake efficient, green product design and life cycle analysis activities.

In this section, we adopt a conceptual model to code the 86 papers identified which have highlighted the three topics or themes related to the adoption of GP:

- 1) Motivations/drivers for the implementation of GP;
- 2) Barriers to the implementation of GP;
- 3) Performance impacts of the adoption of GP.

These three themes are extracted from Walker *et al.*'s (2008) empirical study and literature review on green SCM. However, this coding scheme does not exclude the GP practice itself including that related to suppliers, which is not a theme in Walker *et al.*'s study.

4.1. Drivers towards the adoption of green procurement

The term “Drivers” may be seen motivators that induce business organizations to adopt GP activities (El Tayeb *et al.* 2010). Lee and Klassen (2008) define a driver

as a factor that initiates and motivates firms to begin the environmental management capabilities development process.

Previous research identified numerous drivers that influence firms to adopt GP practices (e.g., Zhu and Sarkis, 2006; Lee and Klassen, 2008; Walker *et al.*, 2008; Zhu *et al.*, 2008a).

The drivers may be divided in two types: internal and external (Lee and Klassen, 2008; Walker *et al.*, 2008; Haake and Seuring, 2009; Ageron *et al.* 2012). As suggested by Walker *et al.* (2008), internal drivers are described here as organizational factors, and external drivers include regulation, customers, competition and society.

Table 2 summarizes the main drivers for GP – grouped into five major categories as suggested Walker *et al.* (2008) – for the 39 articles identified.

Table 2 Papers dealing with drivers of Green Procurement

Author	Internal	External			
	Organizational	Regulatory	Customers	Competition	Society
Green <i>et al.</i> (1996)	X	X	X		
Lamming and Hampson (1996)			X	X	
Handfield <i>et al.</i> (1997)	X		X		X
Carter and Carter (1998)		X	X		
Carter <i>et al.</i> (2000)				X	
Carter and Dresner (2001)	X	X	X		
Min and Galle (2001)		X			
Cousins <i>et al.</i> (2004)					X
Carter and Jennings (2004)	X	X			
Chen (2005)		X		X	X
Preuss (2005)		X			
Rao and Holt (2005)				X	
Zhu and Sarkis (2006)		X	X		
Zhu and Sarkis (2007)		X	X		
Zhu <i>et al.</i> (2007)	X	X	X	X	
Lee and Klassen (2008)	X	X			
Walker <i>et al.</i> (2008)	X	X	X	X	X
Seuring and Müller (2008)		X			
Zhu <i>et al.</i> (2008a)	X		X		
Zhu <i>et al.</i> (2008b)			X		
Haake and Seuring (2009)	X	X	X		X
Holt and Ghobadian (2009)	X	X		X	X
Zhu <i>et al.</i> (2010a)	X	X			

Zhu <i>et al.</i> (2010b)	X	X	X	X	X
Guenther <i>et al.</i> (2010)		X	X		
El Tayeb <i>et al.</i> (2010)		X	X		
Sarkis <i>et al.</i> (2011)		X	X	X	X
Björklund (2011)	X	X	X	X	
Large and Thomsen (2011)	X				
Ageron <i>et al.</i> (2012)	X	X	X	X	
Chan <i>et al.</i> (2012)	X	X	X	X	X
Gimenez and Tachizawa (2012)	X				
Giunipero <i>et al.</i> (2012)	X	X	X	X	X
Hsu <i>et al.</i> (2013)		X	X	X	X
Blome <i>et al.</i> (2013)	X				
Large <i>et al.</i> (2013)	X				
Leppelt <i>et al.</i> (2013)	X				
Plugge and Bouwman (2013)	X				
Zhu and Geng (2013)		X	X	X	X
TOTAL	22	26	22	15	12

The internal/organizational factors have been dealt with in 22 out of the 86 articles identified in this literature review. It appears that the desire to reduce costs (Carter and Dresner, 2001; Green *et al.*, 1996; Handfield *et al.*, 1997; Preuss, 2005; Zhu *et al.*, 2010a) as well as the personal commitment of managers and investors (Walker *et al.*, 2008) represent a strong driving force for environmental supply projects. Chan *et al.* (2012) empirically test the positive relationship between internal environmental orientation (e.g., pro-environmental corporate culture) and adoption of green purchasing. Gimenez and Tachizawa (2012) identify that supplier assessment and collaboration with suppliers facilitate the adoption of green purchasing. Giunipero *et al.* (2012) propose that top management involvement and financial benefits (e.g., cost reduction) are two internal drivers. Hojmosse *et al.* (2012) identify that top management support and trust between buyers and suppliers are drivers to green SCM including green purchasing. Blome *et al.* (2013) also find both top management support and company's market performance leads to the adoption of GP. Large *et al.* (2013) find that purchasing companies' awareness of the need for integrating sustainable aspects in economic decisions is an antecedent or driver in the sustainable logistics service purchasing. Leppelt *et al.* (2013) identify three factors contributing to the adoption of sustainable supplier relationship management (SSRM) in the chemical industry in Germany as: SSRM's alignment with corporate strategy, perceived risk of opportunistic behaviours from suppliers and supplier certification. The final two are

related to suppliers and may represent a new trend of GP research. Plugge and Bouwman (2013) propose that the fit between sourcing capabilities and organizational structure improves sustainable sourcing performance.

As to the external drivers, 26 articles deal with regulatory reasons, 22 with customers' pressures, 15 with competitor pressure and 12 with pressure from society as a whole. A significant body of research indicates that government regulation and legislation are major drivers for companies' environmental efforts (Green *et al.*, 1996; Handfield *et al.*, 1997). A buying firm's involvement in green purchasing is positively related to their perception of the importance of environmental compliance (Min and Galle, 2001; Chan *et al.*, 2012).

The literature points out the role of the customer as a driving force for GP practices. Carter and Carter (1998) describe customers as having a direct impact on firms' environmental purchasing activities. The environmental and non-environmental demands placed by customers are described as having an important influence on environmental purchasing (Min and Galle, 1997; Carter and Carter, 1998; Carter and Dresner, 2001; Walker *et al.*, 2008; Björklund, 2011). Small companies appear to be under particularly severe pressure from their customers (Walker *et al.*, 2008).

As to society overall, the deterioration of the environment over recent decades has drastically increased the public's awareness of environmental issues. The public is increasingly influenced by a company's reputation with respect to the environment when making purchasing decisions (Walker *et al.*, 2008). While reputation can be an important driver (Cousins *et al.*, 2004), the public image of a company is usually associated with its main products (Haake and Seuring, 2009). For Björklund, (2011), the image and reputation of the firm are considered to be important drivers. Chan *et al.* (2012) summarize these and propose an integrated construct of external environmental orientation which denotes the need to satisfy the environmental demands of all external stakeholders.

García-Rodríguez *et al.* (2013) identify that both implementing information systems and being in constant contact with customers facilitate the purchasing of waste from customers for recycling and reuse as raw materials.

4.2 Barriers to the adoption of Green Procurement

Companies often find it difficult to change their strategic and organizational approach in general. This applies also to the implementation of sustainability practices and, in particular, to the adoption of GP practices. Therefore it is very important for companies to be able to identify the barriers to the adoption of GP within their own organizational boundaries as well as at their suppliers.

We have identified 20 articles that deal with implementation barriers. The number of articles dealing with the barriers to GP implementation is fewer than the number of articles dealing with the drivers towards GP barriers (Table 3). The reason for this may be that green supply management research simply tends to give more emphasis to the drivers than to the barriers (Walker *et al.*, 2008).

As suggested by Walker *et al.* (2008) there are both internal and external barriers. The former include costs and lack of legitimacy while the latter include regulation, poor suppliers' commitment and industry-specific barriers.

Several academic studies have proposed that economic preoccupations remain the principal barriers to green supply management, as supported in the 14 articles found. However, as Zhu and Sarkis (2007) argue, green purchasing is often less costly for manufacturers to implement than other green practices. In a previous work, Zhu and Sarkis (2006) find that companies in different industries face different barriers, depending on the particular sector, and three articles look at these specificities. Lack of legitimacy indicates that there is a lack of internal consensus or internal buy-in for the GP investment (Walker *et al.*, 2008). In addition to the two internal barriers stated, Giunipero *et al.* (2012) show that misalignment of short-term and long-term strategic goals impedes the adoption of GP.

Table 3 - Papers dealing with barriers to Green Procurement

Author	Internal		External		
	Costs	Lack of legitimacy	Regulation	Poor supplier commitment	Industry-specific barriers
Bowen <i>et al.</i> (2001a)	X				
Bowen <i>et al.</i> (2001b)		X			
Carter and Dresner (2001)	X				
Min and Galle (2001)	X				
Carter and Jennings (2004)			X		
Zhu and Sarkis (2004)	X				

Rao and Holt (2005)	X	X			
Zhu and Sarkis (2006)			X		X
Zhu and Sarkis (2007)	X				
Zhu <i>et al.</i> (2007)	X				
Carter and Rogers (2008)			X		
Walker <i>et al.</i> (2008)	X	X	X	X	X
Seuring and Müller (2008)	X				
Zhu <i>et al.</i> (2008a)	X				X
Haake and Seuring (2009)	X				
Ageron <i>et al.</i> (2012)	X			X	
Giunipero <i>et al.</i> (2012)	X	X	X		
Genovese <i>et al.</i> (2013)		X		X	
Mathiyazhagan <i>et al.</i> (2013)				X	
Zhu and Geng (2013)	X				
TOTAL	14	5	5	4	3

Five articles focus on regulation being considered as a barrier to GP. Environmental legislation and regulation can inhibit innovation by prescribing so called best available techniques, which prove to be unrealistic for many companies and setting unreasonable deadlines (Walker *et al.*, 2008).

Recently, poor supplier commitment has been identified as a barrier by four papers. For example, Genovese *et al.* (2013) and Mathiyazhagan *et al.* (2013) cite the lack of transparency by suppliers on environmental issues.

The analysis of barriers to GP should be detailed in the light of company size, given that there are major differences between large and small firms, with larger firms being more likely to engage in sustainability (Min and Galle, 2001). Helping suppliers recognize the importance of resolving environmental issues and supporting them in installing their own improvement initiatives is a major issue that companies have to address today (Ageron *et al.*, 2012). Rao and Holt (2005) observe that ‘greening’ different phases of the supply chain leads to an integrated green supply chain, which in turn leads to competitiveness and better economic and operational performance.

According to a recent study by Ageron *et al.* (2012), in the literature many authors show that most companies have two major financial barriers: the difficulty in assessing the amount to invest and evaluating the return on investment. Moreover, additional challenges arise when one considers that sustainability is something relatively new for companies; it requires increased dependence between supply chain partners, and it is difficult to distribute the costs and the benefits between partners.

The return on investment is an important issue that must be confronted in the context of sustainable investments. The important observation is that some of the drivers identified can also act as barriers. For example, regulation can help or hinder green supply management (Porter and van der Linde, 1995), acting as a catalyst for proactive firms or perceived as a restraint by others (Walker *et al.*, 2008).

4.3. Performances of Green Procurement

In the literature, many authors have attempted to discover the performance impact of the adoption of GP practices. However, it is not easy to define the actual performance, which is directly attributed to the adoption of green supply management. A total of 54 articles have been identified in the literature as looking at the performance impact.

As suggested by Zhu *et al.* (2010b), the performance impact can be divided into three categories:

- A. Environmental performance,
- B. Financial performance, and
- C. Operational performance.

Table 4 shows the results of the distribution of the three categories. The environmental performance (47 articles) is the most commonly cited category and includes reduction of emissions, waste and energy, and a decrease in accidents.

The financial performance (37 articles) includes characteristics to reduce costs associated with purchased materials, energy consumption, waste treatment, waste discharge, and fines for environmental accidents.

The operational performance (22 articles) analyzes how to produce more efficiently and how to deliver products to customers by meeting volume/characteristics requirements.

Table 4 - Papers dealing with the performance impact of Green Procurement

Author	Performance		
	Environmental	Financial	Operational
Green <i>et al.</i> (1996)	X		
Handfield <i>et al.</i> (1997)	X		
Noci (1997)	X		
Carter <i>et al.</i> (1998)		X	

Green <i>et al.</i> (1998)	X		
Walton <i>et al.</i> (1998)	X		
Zsidisin and Hendrick (1998)	X		
Carter <i>et al.</i> (2000)	X	X	
Bowen <i>et al.</i> (2001a)	X	X	
Bowen <i>et al.</i> (2001b)	X		
Carter and Dresner (2001)	X	X	X
Min and Galle (2001)	X		
Preuss (2001)	X		
Zhu and Geng (2001)	X	X	
Zsidisin and Siferd (2001)	X	X	X
Handfield <i>et al.</i> (2002)	X	X	X
Nagel (2003)	X		
Sarkis (2003)		X	X
Zhu and Sarkis (2004)	X	X	X
Chen (2005)	X	X	
Rao (2005)	X	X	
Simpson and Power (2005)	X	X	X
Zhu and Sarkis (2007)	X	X	
Zhu <i>et al.</i> (2007)	X	X	X
Carter and Rogers (2008)	X	X	
Walker <i>et al.</i> (2008)	X	X	
Seuring and Müller (2008)	X	X	
Lee and Klassen (2008)	X	X	X
Zhu <i>et al.</i> (2008a)	X	X	X
Zhu <i>et al.</i> (2008b)	X		
Hsu and Hu (2009)	X		
Holt and Ghobadian (2009)	X		
Jabbour and Jabbour (2009)	X		X
Lee <i>et al.</i> (2009)	X		
Nawrocka <i>et al.</i> (2009)	X		
Bai and Sarkis (2010)	X	X	
El Tayeb <i>et al.</i> (2010)	X	X	
Hwang <i>et al.</i> (2010)	X	X	X
Pagell <i>et al.</i> (2010)	X	X	X
Zhu <i>et al.</i> (2010a)	X	X	X
Zhu <i>et al.</i> (2010b)		X	
Hollos <i>et al.</i> (2011)		X	X
Large and Thomsen (2011)	X	X	X
Leppelt <i>et al.</i> (2013)	X	X	X
Sarkis <i>et al.</i> (2011)	X	X	
Chan <i>et al.</i> (2012)		X	
Liu <i>et al.</i> (2012)		X	X
Green and Zelbst (2012)	X	X	X
Lee <i>et al.</i> (2012)		X	X
Zailani <i>et al.</i> (2012)	X	X	X
Zhu <i>et al.</i> (2012a)	X	X	X
Zhu <i>et al.</i> (2012b)	X	X	X
Gimenez and Sierra (2013)	X		
Rosić and Jammernegg (2013)	X	X	
TOTAL	47	37	22

Several authors confirm that financial performance is the most important trigger for companies that wish to implement environmental management programmes. It has been argued that success in addressing environmental issues may provide new opportunities for competition, and new ways to add value to core business programmes (Zhu *et al.*, 2010b).

Zhu and Sarkis (2004) find a positive relationship between the adoption of green supply practices and improvements in environmental and financial performance. However, positive environmental performance does not mean simultaneous positive

financial and operational performance or vice versa (Zhu *et al.*, 2010b) and there is still limited research showing a positive relationship.

The results from Carter *et al.* (2000), Rao and Holt (2005), and Chan *et al.* (2012) show that GP has a positive effect on a firm's performance regarding net income and cost of goods sold. Zhu *et al.* (2010b) also find that green purchasing is significantly linked to the financial performance of a firm.

In a previous work, Zhu *et al.* (2005) completed investigations into relationships among various dimensions of environmental practice and performance issues. Whether these relationships may have been moderated by various institutional pressures was not evaluated. However, through examination, Bowen *et al.* (2001a) and Carter and Dresner (2001) suggest that economic performance is not being reaped in the form of short-term profitability and sales performance. Green *et al.* (1998) argue that green purchasing and supply policies are likely to result in improved environmental performance.

What is missed out in Walker *et al.*'s (2008) study is supplier performance as a result of GP initiatives. Some researchers have introduced the significance of environmental factors in evaluating suppliers' overall performance (Green *et al.*, 1996, Noci, 1997; Handfield *et al.*, 2002; Jabbour and Jabbour, 2009; Hsu and Hu, 2009; Zhu *et al.*, 2010b). Monitoring and evaluating suppliers' performance is also a necessary phase involved in the process (Noci, 1997; Walton *et al.*, 1998; Lee *et al.*, 2009). In other cases, companies go for a partnering and mentoring approach to achieve sustained improvements in environmental performance (Lamming and Hampson, 1996; Handfield *et al.*, 1997).

The development of stronger and more open relations between buyers and suppliers is described as having an impact on environmental performance (Zsidisin and Hendrick, 1998; Zsidisin and Siferd, 2001). Firms can only achieve overall environmental performance if suppliers provide environmentally friendly products through environmentally friendly technologies (Rao, 2005). Companies rely on suppliers to increase their performance and consequently that of the entire supply chain. In this way suppliers, who represent a critical resource for companies, can create a competitive advantage by being proactive in environmental practice. In this context, companies have no choice but to integrate sustainable practices in the selection and management of their suppliers (Min and Galle, 1997; Bai and Sarkis,

2010). Organizations can gain competitive advantage by being the first to adopt environmental sustainability and implement GP practices (Handfield *et al.*, 1997).

There are several very recent papers published in 2013 dealing with green purchasing's impact on suppliers' performance and involvement in the green initiatives by focal firms. For example, Blome *et al.* (2013) find that the relationship between GP and supplier performance is fully mediated by green supplier development. Caniels *et al.* (2013) identify supplier readiness and customer requirements to be significant drivers in supplier participation of GP initiatives by a focal company. They also find that cooperative relation norms and customer investment work as additional drivers in green SCM for larger suppliers. Dou *et al.* (2013) propose a construct of suppliers' Green Supplier Development (GSD) involvement propensity (the willingness to be involved in a specific GSD programme) and use it when evaluating the GDP programmes that improve suppliers' performance. Gimenez and Sierra (2013) quote supplier assessment and collaboration with suppliers as improving the environmental performance of GP. Rosič and Jammerneegg (2013) propose an emission trading scheme encouraging dual sourcing from onshore and offshore suppliers in order to balance the economic and environmental performance for a firm.

5. Discussion and future research directions

5.1. Descriptive findings

There was a surge in terms of number of publications (52 out of 86) related to GP between 2008 and 2013, showing that this has been a hot research topic in recent years. 57 papers were published in OM journals, which is not surprising as GP is an OM topic. However, the single journal that publishes 13 papers on GP related topics is the *Journal of Cleaner Production (JCP)*, which is not a traditional OM journal. This is quite impressive and shows the interdisciplinary nature of JCP. In terms of research methodology used, the survey was used by half of the 86 contributions. This is aligned with the current state of research on this topic in that the majority of the papers attempted to test the causal relationships between drivers/barriers and the adoption of GP, and between GP and performance. Case studies seem to be under-represented due to the emerging nature of this body of literature. The test of drivers and barriers represent one of the initial steps toward theorising in a research area after

defining it (Kuhn, 1962); however, a list of hypotheses without logical links between them is not a theory but an important part of it (Sutton and Staw, 1995). This represents an evidence for the argument presented by many papers (e.g., Tate *et al.*, 2012) that the GP research is still in its early stage.

The review shows that the empirical studies on the topic tend to focus on the manufacturing industries; few focused on service industries. In terms of geographical regions the authors were based (i.e., normally where they carried out the research), in the USA and UK which were the focus of the majority of the papers (58%). Although developed nations tend to be more advanced in this regard, it has become increasingly important to be focused more on developing nations which represent large scale manufacturing (e.g., China) and/or a service supply base (e.g., India).

We also identified the theoretical foundation of the papers reviewed (see Appendix). It was found that 25 out of the 86 papers have applied at least one theoretical framework. Among those published before 2007 (32 papers), there were only three papers adopting an established theoretical framework. This shows that researchers tend to build their research on sound theoretical bases nowadays.

5.2. Drivers and barriers

It seems that the research on external drivers started being mature and included a comprehensive list of regulatory, customers, competitors and society drivers, as well as their impact on performance, in 2008. Several significant empirical studies have been devoted to this (Walker *et al.*, 2008; Zhu *et al.*, 2010b; Ageron *et al.*, 2012; Björklund, 2011; Sarkis *et al.*, 2011). An integrated construct of external environmental orientation combining the various demands from external stakeholders proposed by Chan *et al.* (2012) is especially worth noting.

Research on internal drivers lags behind that of external drivers and was focused on cost reduction and the personal commitment of managers before 2011. This is shown in the fact that more external drivers were identified than internal (table 2). There were several studies on internal/organizational drivers that emerged in the past two years: environmental orientation (Chan *et al.*, 2012); top management support (Hoejmose *et al.*, 2012); integrating sustainable aspects in economic decisions (Large *et al.*, 2013); alignment with corporate strategy (Leppelt *et al.*, 2013); perceived risk from opportunistic behaviour of suppliers (Leppelt *et al.*, 2013); supplier certification (Leppelt *et al.*, 2013); supplier assessment and collaboration with suppliers (Gimenez

and Tachizawa, 2012; Hojmosse *et al.*, 2012). The latter ones, i.e. those related to suppliers, can also be seen as external drivers and have rarely been seen in the literature before 2012.

The economic preoccupations remain the principal barrier for GP. Table 3 indicates that most of the barriers to GP tend to be internal rather than external.

The barriers to the adoption of GP mirror the same aspects as those for drivers. For example, cost reduction is a driver while cost of investment in GP practice presents a barrier. Collaboration with the supplier is a driver while poor supplier commitment serves a barrier. In future research, the subject of barriers may not justify itself as a separate research theme but be combined with drivers for empirical model testing.

5.3. *Performance*

It seems that the existing categorization of GP performance (e.g., the trio of environmental, financial and operational performance) does not capture the whole spectrum that a company would need to measure, according to the literature (Zsidisin and Siferd, 2001; Handfield *et al.*, 2002; Zhu *et al.*, 2008a; 2010; 2012). Social aspect should be considered and included in the list (Zailani *et al.*, 2012). Another aspect gaining increasing attention is the performance of suppliers as a result of the adoption of GP. However, the existing research mainly looks at the suppliers' financial performance (Blome *et al.*, 2013; Caniëls *et al.*, 2013; Dou *et al.*, 2013; Gimenez and Sierra, 2013) and ignores other aspects (e.g., environmental and social performance), which are considered to be equally important.

Summarizing the three themes (drivers, barriers and performances), the involvement of and engagement with suppliers has drawn increasing attention from researchers in the last two years (2012 and 2013), shown in the fact that the majority of the papers written on this subject were published during these two years. It is reasonable in a sense that GP research simply could not neglect the other side of the coin. A buyer-centric view should give way to a dyadic view at least, if not a supply network one.

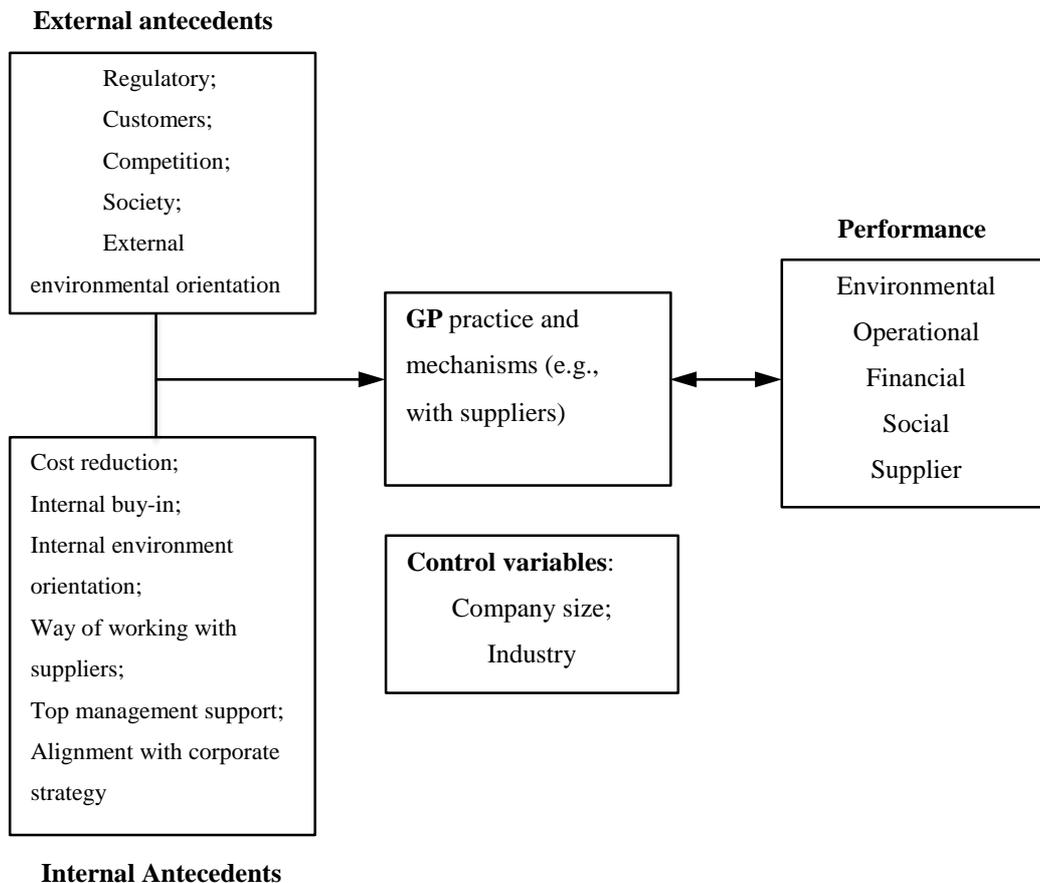
5.4. *Development of an integrated model*

Based on the literature review, we develop a model for future research (Fig. 4). On the left hand side, drivers and barriers are combined. We adopt the term

antecedents and rename them external and internal antecedents. We intend to be comprehensive here and include all the drivers and barriers (internal and external) discussed in the findings section. Within the GP box, it is recommended that researchers direct their attention to how companies actually carry out GP; more best practice research is needed in the future.

In terms of performance of GP, we have identified from the literature that social impact and suppliers' performance should be taken into account in addition to the trio of environmental, operational and financial performance currently adopted. In addition, we find that the relationship between GP and performance is not one-way i.e., the former leads to the latter, but reciprocal. The improved performance leads to a deeper adoption of GP practice. Bowen *et al.* (2001a) state that organizations will adopt GP practices if they identify that this will result in specific financial and operational benefits. Blome *et al.* (2013) also suggest that company practices have shown that the improved market performance of a firm leads to the adoption of GP.

Fig 4. A conceptual model of Green Procurement



5.5. Future research directions

The literature review and the conceptual framework (Fig. 4) have opened a few future research directions, as detailed below.

First, external antecedents may be well established but it may be worthwhile testing a higher level construct (e.g., external environmental orientation). With the maturation of the research in internal antecedents, it is advisable to look at their relationship or interaction with external ones and their combined effects on GP adoption.

Second, the implementation of green supply management is not well understood. More research is needed to understand the best practice of GP. Gimenez and Tachizawa's (2012) review attempts to identify the practice of extending sustainability to suppliers by a focal company but only found two themes of supplier assessment and collaboration. Miemczyk *et al.* (2012) find that the majority of Sustainable Supply Management (SSM) research focuses on the selection and contracting process, and on the evaluation process of suppliers; however, few papers actually address other purchasing processes, such as supplier development, spending analysis and supply market analysis.

Antecedents/drivers discussed and related to suppliers in this review can also be considered GP practice related to suppliers or external GP practice (term borrowed from Zhu *et al.*'s (2012a) external green SCM). These include collaboration with suppliers, supplier certification and supplier assessment.

There is, therefore, a strong need for further scholarly research, dealing with 'best practice' case studies and building larger field studies, in order to map the field and support its progress. Tate *et al.* (2012) find that academic research in environmental purchasing lags behind practice; yet the practice is still emerging. We as researchers cannot simply prescribe something for the industry; therefore, more case study types of research are needed to find out what is or has been happening in the industry in terms of GP. In this sense, longitudinal or retrospective type of case studies is welcome. For example, Miemczyk *et al.* (2012) propose two research directions: non supply chain stakeholders' role in implementing SSM, and supplier development and involvement in sustainable new product development (NPD).

Another research direction related to suppliers is the adoption of green supplier selection criteria in the procurement process. Research on green supplier selection is highly fragmented and in danger of overemphasizing the technical aspects of supplier selection (Igarashi *et al.*, 2013). Their literature review reveals specific practices that

often vary and depend on the service, product, resource, material, substance or commodity being purchased. However, further analysis should focus on the overall benefits and opportunities of GP, at present not extensively studied. Integrating environmental, health and safety aspects of products/services into the supplier selection process (and weighting them accordingly), alongside the traditional criteria of cost, quality, safety and technical performance continues to be the major challenge.

Third, there is a lack of simple tracking and measurement techniques to quantify and help communicate the benefits of GP activities. There is a need for measuring and reporting that enables products and services to be compared and enables private and institutional investors, as well as the banks and insurance agencies, to use the information. There is a call for idiosyncratic environmental performance measurements specifically made for each supply chain. This might be achieved through supply management learning and selecting environmental performance measurements jointly between buyers and their suppliers. The vast majority of studies in the field of green supply management focus on large organizations; future research could also focus on small and medium sized companies. Thus, there is a clear research need to establish the potential link between GP initiatives and increased competitiveness and enhanced economic, environmental and operational performance, to provide an impetus for organizations to green their supply chains.

Also, we noted that the importance of social and supplier performance has risen in researchers' agendas these days, but it is still in its early stages due to the perception that the adoption of GP has a social impact and a buyer-centric view does not help the progress of GP research. A dyadic view is needed to understand both buyers' and suppliers' perspectives. In reality, buyers need to work with suppliers in order to implement GP. Therefore a comprehensive performance measurement system, including all the aspects listed in Fig. 4, needs to be in place for GP.

The performance measures are not only the results of the adoption of GP but serve as drivers or barriers for companies to deepen their adoption of GP. So the relationship between them is reciprocal and could be tested in future empirical studies. This proposition needs to be tested by future empirical research.

Fourth, further research should explore whether GP should be investigated separately or integrated with economic and social aspects, i.e., taking corporate social responsibility (CSR) as an integrated concept. Carter and Rogers (2008) propose that firms have to perform well in all aspects of Purchasing Social Responsibility (PSR) in

order to keep their reputation intact. The current practice of companies tends to separate environmental practice from socially responsible practice but may in the future find ways of integrating them to form a coherent sustainability strategy. Coca-Cola's water stewardship is good example in point, helping to preserve water for the benefits of the environment and benefiting local communities at the same time. More best practice type of research needs to be identified in order to theorise in this area.

Fifth, Tate *et al.* (2012) argue that most of the research in environmental purchasing is not grounded in theory. The current practices or initiatives related to GP are fragmented. An integrated approach is needed in order to understand the process of implementation. It is argued that the implementation of GP can be seen as radically innovative, therefore an innovation (diffusion) management approach might be taken. Since innovation is associated with uncertainty (Bessant and Tidd, 2008; Tate *et al.*, 2012), the implementation process requires the mitigation of uncertainty or risk. Based on the innovation and risk management literature, a process management model for GP could be developed.

The application of theories within GP research is still a very recent phenomenon. It appears that institutional theory, contingency theory and stakeholder theory are those most used. The papers applying Transaction Cost Economics (TCE) Resource Based View (RBV) and Resource Dependence Theory (RDT) theories are few. Tate *et al.* (2012) also call for theory building research in environmental purchasing. Sarkis *et al.* (2011) indicate that there are ample opportunities for future research and investigation of sustainable SCM with theories that have already been applied, have yet to be applied, and may still be developed. Researchers should ground their research in sound theoretical frameworks in order to build or refine robust theories on GP.

6. Conclusions

In this paper, we have carried out a comprehensive literature review on GP in the private sector between 1996 and 2013, building on Walker *et al.*'s (2008) three themes of environmental SCM: 1) the motivation and drivers for the implementation of GP; 2) the barriers to the implementation of GP; and 3) the performance impacts of the adoption of GP. We find that the research is growing fast in terms of number of articles published and the variety of the journals in which this topic is discussed. It

goes well beyond what Walker *et al.* (2008) have reviewed and has included more detailed internal drivers, external drivers related to suppliers, barriers and social and supplier performance measurements. We contribute to the GP research by presenting a comprehensive list of drivers, barriers and measurements, developing a conceptual framework of GP for future empirical research (Fig. 4) and proposing a number of critical future research directions in this research area.

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Appendix: Country of origin, industry investigated, method and theory of the selected papers

No.	Author	Country	Industry	Method	Theory
1	Green <i>et al.</i> (1996)	UK	Healthcare	Case	No
2	Lamming and Hampson (1996)	UK	Mixed	Case	No
3	Handfield <i>et al.</i> (1997)	USA	Furniture	Case	No
4	Min and Galle (1997)	USA	Mixed	Survey	No
5	Noci (1997)	Italy	Mixed	Model	No
6	Carter and Carter (1998)	USA	Manufacturing	Survey	No
7	Carter <i>et al.</i> (1998)	USA	Mixed	Survey	No
8	Enarsson (1998)	Sweden	Mixed	Model	No
9	Green <i>et al.</i> (1998)	UK	Healthcare	Case	No
10	Walton <i>et al.</i> (1998)	USA	Furniture	Case	No
11	Zsidisin and Hendrick	USA	Mixed	Survey	No

	(1998)				
12	Carter <i>et al.</i> (2000)	USA	Not spec	Survey	No
13	Bowen <i>et al.</i> (2001a)	UK	Mixed	Survey	No
14	Bowen <i>et al.</i> (2001b)	UK	Mixed	Survey	RBV
15	Carter and Dresner (2001)	USA	Mixed	Case	Institutional theory
16	Min and Galle (2001)	USA	Mixed	Survey	No
17	Preuss (2001)	UK	Mixed	Case	No
18	Zhu and Geng (2001)	China	Mixed	Survey	No
19	Zsidisin and Siferd (2001)	USA	Mixed	Review	TCE
20	Handfield <i>et al.</i> (2002)	USA	Electronics	Model	No
21	Nagel (2003)	Netherlands	Electronics	Model	No
22	Sarkis (2003)	USA	Not spec.	Model	No
23	Cousins <i>et al.</i> (2004)	UK /Canada	Not spec.	Conceptual	No
24	Carter and Jennings (2004)	USA	Manufacturing	Survey	No
25	Zhu and Sarkis (2004)	China /USA	Manufacturing	Survey	No
26	Chen (2005)	Taiwan	Mixed	Conceptual	No
27	Preuss (2005)	UK	Mixed	Case	No
28	Rao and Holt (2005)	Philipp./UAE	Mixed	Survey	No
29	Rao (2005)	Philippines	Manufacturing	Survey	No
30	Simpson and Power (2005)	Australia	Manufacturing	Conceptual	TCE
31	Byggeth and Hochschorner (2006)	Sweden	Mixed	Model	No
32	Zhu and Sarkis (2006)	China/USA	Mixed	Survey	No
33	Zhu and Sarkis (2007)	China/USA	Manufacturing	Survey	Institutional theory
34	Zhu <i>et al.</i> (2007)	China/USA	Manufacturing	Survey	No
35	Carter and Rogers (2008)	USA	Not spec.	Conceptual	Triple bottom line
36	Lee and Klassen (2008)	Korea/Canada	Manufacturing	Case	Dynamic capabilities
37	Seuring and Müller (2008)	Germany	Mixed	Review	N/A
38	Walker <i>et al.</i> (2008)	UK	Mixed	Case	No
39	Zhu <i>et al.</i> (2008a)	China/USA	Mixed	Survey	RBV/ Stakeholder/institutional theory
40	Zhu <i>et al.</i> (2008b)	China/USA	Mixed	Survey	No
41	Hsu and Hu (2009)	China	Electronics	Model	No
42	Haake and Seuring (2009)	Germany	Not spec.	Review	No
43	Holt and Ghobadian (2009)	UK	Manufacturing	Survey	No
44	Jabbour and Jabbour (2009)	Brazil	Mixed	Case	No
45	Lee <i>et al.</i> (2009)	China	Electronics	Model	No
46	Nawrocka <i>et al.</i> (2009)	Sweden	Manufacturing	Survey	No
47	Bai and Sarkis (2010)	China/USA	Mixed	Model	Rough set theory
48	El Tayeb <i>et al.</i> (2010)	Malaysia	Manufacturing	Case	No
49	Ho <i>et al.</i> (2010)	UK	Not spec.	Review	N/A
50	Guenther <i>et al.</i> (2010)	Germany	Mixed	Survey	No
51	Hwang <i>et al.</i> (2010)	China	Mixed	Model	No
52	Pagell <i>et al.</i> (2010)	USA	Mixed	Case	Purchasing portfolio management

53	Zhu <i>et al.</i> (2010a)	China/USA	Not spec.	Survey	Purchasing portfolio management
54	Zhu <i>et al.</i> (2010b)	China/Japan	Manufacturing	Model	No
55	Björklund (2011)	Germany	Mixed	Survey	No
56	Hollos <i>et al.</i> (2011)	Germany	Mixed	Survey	RBV/RDT
57	Large and Thomsen (2011)	Germany/Spain	Mixed	Model	No
58	Sarkis <i>et al.</i> (2011)	USA/China	Mixed	Review	Organizational theories
59	Ageron <i>et al.</i> (2012)	France/USA	Mixed	Survey	No
60	Chan <i>et al.</i> (2012)	China/ UK/ New Zealand	Mixed	Survey	Stakeholder
61	Gimenez and Tachizawa (2012)	Spain	Not spec.	Review	N/A
62	Giunipero <i>et al.</i> (2012)	USA	Mixed	Survey	No
63	Green <i>et al.</i> (2012)	USA	Manufacturing	Model	No
64	Hoejmose <i>et al.</i> (2012)	UK	Mixed	Survey	No
65	Liu <i>et al.</i> (2012)	USA/S.Korea	Electronics	Survey	No
66	Hoejmose and Adrien-Kirby (2012)	UK	Not spec.	Review	N/A
67	Hsu <i>et al.</i> (2013)	USA/Malaysia	Manufacturing	Survey	No
68	Lee <i>et al.</i> (2012)	USA/South Korea	Electronics	Survey	RDT
69	Miemyzyk <i>et al.</i> (2012)	France	Not spec.	Review	N/A
70	Tate <i>et al.</i> (2012)	USA	Mixed	Survey	N/A
71	Zailani <i>et al.</i> (2012)	Malaysia	Manufacturing	Survey	TCE
72	Zhu <i>et al.</i> (2012a)	China /USA	Manufacturing	Survey	Ecological modernization perspective
73	Zhu <i>et al.</i> (2012b)	China/USA	Manufacturing	Survey	Coordination
74	Blome <i>et al.</i> (2013)	Belgium/ Germany/ Denmark	Mixed	Survey	Institutional/ RBV/NRBV
75	Caniëls <i>et al.</i> (2013)	Netherlands	Automotive	Survey	No
76	Dou <i>et al.</i> (2013)	China/USA	Manufacturing	Model	Grey system
77	García-Rodríguez <i>et al.</i> (2013)	Spain/ Venezuela	Mixed	Conceptual	Contingency
78	Genovese <i>et al.</i> (2013)	UK / Italy	Manufacturing	Survey	No
79	Gimenez and Sierra (2013)	Spain	Mixed	Survey	Relational governance
80	Igarashi <i>et al.</i> (2013)	Norway	Not spec.	Review	N/A
81	Large <i>et al.</i> (2013)	Germany	Mixed	Survey	No
82	Leppelt <i>et al.</i> (2013)	Germany	Chemical	Case	Sustainable business practice
83	Mathiyazhagan <i>et al.</i> (2013)	India/Denmark/ China	Manufacturing	Survey	No
84	Plugge and Bouwman (2013)	Netherlands	IT	Survey	Contingency
85	Rosič and Jammernegg (2013)	Austria	Not spec.	Model	No
86	Zhu and Geng (2013)	China	Manufacturing	Survey	Institutional theory