The current issue and full text archive of this journal is available at
www.emeraldinsight.com/0972-7981.htm

Green supply chain management

Implementation and performance – a literature review and some issues

Sunil Luthra and Dixit Garg
Mechanical Engineering Department, National Institute of Technology, Kurukshetra, India, and
Abid Haleem
Mechanical Engineering Department, Faculty of Engineering and Technology, Jamia Millia Islamia University, New Delhi, India

Abstract

Purpose – The purpose of this paper is to introduce and provide an overview of the various issues related to Green Supply Chain Management (GSCM) and suggest further scope and direction of research in this emerging field.

Design/methodology/approach – The work relies on experiences, case studies and other literature related to GSCM. Literature has been segregated to understand various GSCM issues. A detailed review is used to sort out the literature and develop the research direction of the study. The review is focussed on development of GSCM including all those researchers which is relevant to environmental and social sustainability toward operation management and the supply chain. A literature review seems to be a valid approach, as a necessary step in structuring a research field.

Findings – The objectives of this paper are to identify major research work conducted on GSCM and to classify them to identify gaps in literature and opportunities for future research. The paper has provided an integrative framework for study, design, implementation and GSCM performance. The findings also identify a number of issues that need to be addressed.

Research limitations/implications – Implication of the work is that the knowledge of the research gap can be used to focus efforts on key areas so as to ensure speedy and comprehensive implementation of GSCM practices.

Practical implications – The paper may prove to be a very useful source of information to practitioners and regulators in their green practices implementation programs.

Originality/value – This paper provides some of the very first insights into development of GSCM theories. The methodological review will provide better understanding of the current state of research in the discipline.

Keywords Performance measurement, Supply chain management (SCM), Green supply chain management (GSCM), Green supply chain management implementation

Paper type Literature review

Introduction

In recent years the topic of Green Supply Chain Management (GSCM) has received growing attention and has become an increasingly popular research area. More and more people are becoming aware of the world's environmental problems including global warming; toxic substance usage and decreasing non-replenishable resources. Several organizations have responded to environmental issues by implementing green

Journal of Advances in Management Research
Vol. 11 No. 1, 2014
pp. 20-46
© Emerald Group Publishing Limited
0972-7981
DOI 10.1108/JAMR-07-2012-0027

The authors would like to thank Dr Sanjay Kumar, Professor, Department of Mechanical Engineering, IITM, Murthal-131039, Haryana (India) and Professor Sanjay, Department of Mechanical Engineering, Galgotias College of Engineering and Technology, Greater Noida, India for the support and technical advice.

المنارة للاستشارات
www.mana

principles within their organization, such as using environmentally friendly raw materials, reducing reliance on petroleum and using recycled papers for packaging. These green principles have been expanded to many departments within an organization and its supply chain.

Objectives and methodology of the paper

The objectives of this paper are to identify and report the major research work conducted on GSCM. The review of the extant literature helps to identify gaps in literature and provides opportunities for future research. A literature review seems to be a valid approach, as a necessary step in structuring a research field and forms an integral part of any research (Easterby-Smith *et al.*, 2002). This helps to identify the conceptual content of the field and guides toward theory development (Meredith, 1993).

GSCM is an emerging field and only few reviews have been made over the years to examine various aspects of GSCM-related research. A number of existing reviews explore the GSCM literature for implications of environmental concerns on firm's individual functions involving activities such as product design, green manufacturing or green transportation. In this work, we have examined the existing studies from several perspectives, i.e. key themes of GSCM, methodology/techniques used in research, type of models developed, research methods used, type of industry considered in research, GSCM implementation enablers/barriers and performance measurement in GSCM. Moreover, most of the existing reviews cover literature that is, in some cases, over a decade old. Our review focusses on more recent research in this fast changing and growing field.

The distribution of the publication from 1995 to 2012 is shown in Figure 1. The results show that approximately 70 percent of the work involving the main

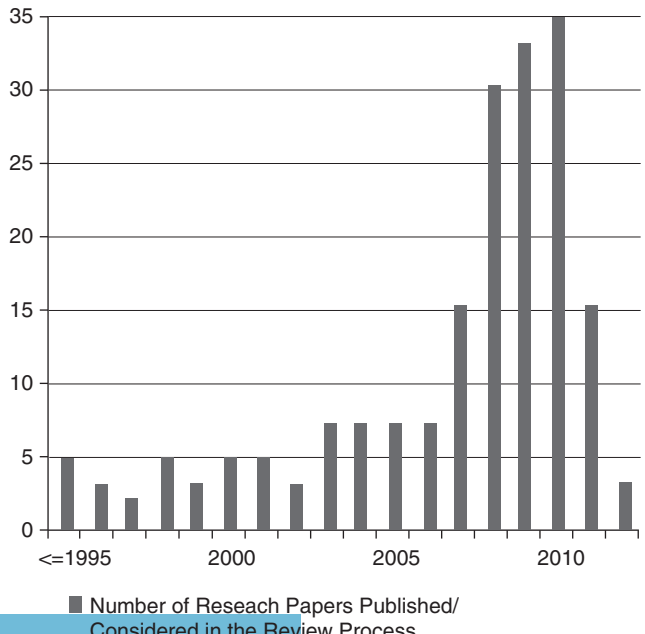

Figure 1.
Number of research papers published/ considered per year in the review process

www.mana

concepts in that define the theme of GSCM appeared in the last five years (2007-2011), which indicates the need for maturation, suggesting a field with great scope for future study.

Organization of the paper

Different definitions of GSCM suggested by various researchers discussed in next section. Afterwards, key themes of GSCM have been identified and described. Thereafter, techniques/methodologies applied, models developed, research methods and industry considered in the research related to GSCM reported in the literature have been discussed. Thereafter, literature on enablers and barriers to implement GSCM has been discussed. GSCM performance measurement review has been explored in the next section. In the last sections, discussions of research presented followed by conclusions and future research directions.

GSCM defined

GSCM is an emerging field that strands out of the traditional supply chain perspective. Various definitions have been suggested by different researchers. Some of them are given as (Table I).

Key themes of GSCM

We have identified six key themes of GSCM from the literature synthesis. This classification helps in broadly identifying areas for the research and problem formulation. The six key themes of GSCM include: – Green Product Development, Green Design, Green Purchasing and Green Raw Materials Procurement, Green Process Planning, Green Manufacturing and Green Transportation.

Frequency of GSCM key themes reported in the literature considered is represented in Table II and Figure 2.

It has been observed that Green Purchasing and Green Raw Material Procurement, Green Design, Green Transportation, and Green Manufacturing have gained more attention of researchers than Green Process Planning, and Green Product Development as they need more research.

Techniques/methodologies applied and models developed toward GSCM development reported in the literature

Different concepts, techniques/methodologies applied and models developed toward GSCM development have been suggested by different researchers. The brief summary of various tool/techniques used in the area GSCM reported in the literature has been shown in Table III.

It is evident that the two techniques, factor analysis and regression analysis have been used more as compared to other statistical tools and techniques. It is important to mention here that other tools and techniques needs to be explored and utilized in the field.

Various models like Conceptual Model, Closed Loop Supply Chain Model, Multi Objective Optimization Models and Green Logistic Model of GSCM for optimization of efficiency have reported in the literature. Summary for various models of GSCM reported in the literature has been shown in Table IV.

Conceptual models have been most reported and supply chain operation reference models have been least reported in the literature. It shows most of models are conceptual in nature. Yet more studies are required to complete this emerging field.

المنارة للاستشارات
www.mana

Sl. no.	GSCM definition as reported in the literature	Researcher(s)
1	Green supply referred to the way in which innovations in SCM and industrial purchasing may be considered in the context of the environment	Green *et al.* (1996)
2	GSCM is as the practice of monitoring and improving environmental performance in the supply chain	Godfrey (1998, p. 244)
3	Environmental/GSCM consists of the purchasing function's involvement in activities that include reduction, recycling, reuse and the substitution of materials	Narasimhan and Carter (1998)
4	GSCM is integrating environmental thinking into SCM	Gilbert (2000)
5	GSCM is the set of SCM policies held, actions taken and relationships formed in response to concerns related to the natural environment with regard to the design, acquisition, production, distribution, use, re-use and disposal of the firm's goods and services	Zsidisin and Siferd (2001)
6	GSCM is the summation of Green Purchasing, Green Manufacturing/Materials Management, Green Distribution/ Marketing and Reverse Logistics	Hervani *et al.* (2005)
7	GSCM covers all phases of the product's life cycle from design, production and distribution phases to the use of products by the end users and its disposal at the end of the product's life cycle	Zhu and Sarkis (2006)
8	GSCM are the concerted efforts throughout the company and is more than simply putting some green practices in place, but a consistent, holistic improvement of the environmental performance on all levels of management and shop-floor	Davies and Hochman (2007)
9	GSCM is adding "green" component to SCM, including green operations, Green Design, Green Manufacturing, Reverse Logistics and Waste Management	Srivastva (2007)
10	GSCM is as an approach for improving performance of the processes and products according to the requirements of the environmental regulations	Hsu and Hu (2008)
11	GSCM is as a managerial approach that seeks to minimize a product or service's environmental and social impacts or footprint	Rettab and Ben Brik (2008)
12	GSCM ranges from Green Purchasing (GP) to integrated life cycle management supply chains flowing from supplier, through to manufacturer, customer and closing the loop with reverse logistics	Zhu *et al.* (2008b)
13	GSCM (the integration of both environmental and SCM) is a proven way to reduce a company's impact on the environment while improving business performance	Torielli *et al.* (2011)

Note: From above definitions, it may be concluded that GSCM is a multidisciplinary issue that emerges mainly from performing environmental management practices in the context of supply chains keeping economic criteria in to the mind

Table I.
Various definitions of GSCM as reported in the literature

The literature has also been categorized based on research methods like case studies/surveys/empirical studies, mathematical and OR-based models, interviews and other methods. A summary of research methods is given in Table V.

Various research methods like "case studies/surveys/empirical Studies," "mathematical and OR based models," "interviews" and some other methods have been used by various researchers in the area of GSCM. The frequency of case studies/

المنارة للاستشارات

www.mana

Components of GSCM	Researcher's	Frequency
Green Product Development	Hendrickson and Tuttle (1997), Gungor and Gupta (1999), Pujari *et al.* (2003), Srivastva (2007), Chen *et al.* (2008), Mudgal *et al.* (2009), Tan and Zailani (2009), Lettice *et al.* (2010), Luh *et al.* (2010)	09
Green Design	Gungor and Gupta (1999), NRCC (2003), Seuring (2004), Kainuma and Tawara (2006), Srivastva (2007), Alhola (2008), Chung and Wee (2008), Tseng *et al.* (2008), Bojarski *et al.* (2009), Chen and sheu (2009), Chu *et al.* (2009), Eltayeb and Zailani (2009), Forte (2009), Ortiz *et al.* (2009), Seuring (2009), Dutta *et al.* (2010), Gosálbez and Grossmann (2010), Ilgin and Gupta (2010), Gonzales *et al.* (2010), Lettice *et al.* (2010), Chung and Wee (2011), Chaabane *et al.* (2012)	20
Green Purchasing and Green Raw Material Procurement	Mandal and Deshmukh (1994), Lamming and Hampson (1996), Min and Galle (1997), Motwani *et al.* (1998), Walton *et al.* (1998), Gungor and Gupta (1999), Nagel (2000), Krause *et al.* (2001), Narasimhan and Das (2001), Handfield *et al.* (2002), Humphreys *et al.* (2003), Sarkis (2003), Roche and Toyne (2004), Sarkar and Mohapatra (2006), Vachon and Klassen (2006), Wu and Shen (2006), Srivastva (2007), Alhola (2008), Kannan *et al.* (2008), Salam (2008), Eltayeb and Zailani (2009), Eltayeb *et al.* (2009), Hsu and Hu (2009), Kumar *et al.* (2009), Meyer (2009), Qingkui and Junhu (2009), Shen and Saijo (2009), Auger *et al.* (2010), Hwang *et al.* (2010), Ninlawan *et al.* (2010), Bai and Sarkis (2010a, b), Sheu (2011), Yeh and Chang (2011)	34
Green Process Planning	Gungor and Gupta (1999), Guide *et al.* (2003a, b), Wu and Shen (2006), Srivastva (2007), Tan and Zailani (2009)	05
Green Manufacturing	Gungor and Gupta (1999), Gilbert (2000), Umeda *et al.* (2003), Kocabasoglu *et al.* (2007), Linton *et al.* (2007), Srivastva (2007), Fuse and Kashima (2008), Forte (2009), PaneHaden *et al.* (2009), Cheng and Wei (2010), Ilgin and Gupta (2010), Gonzales *et al.* (2010), Ninlawan *et al.* (2010), Nunes and Bennett (2010), Olugu *et al.* (2010), Chung and Wee (2011)	16
Green Transportation and Distribution	Cooper (1994), Penman (1994), Kroon and Virjens (1995), Rogers and Ronald (1998), Chopra and Meindl (2001), Dowlatshahi (2000), Dullaet *et al.* (2005), Sheu *et al.* (2005), Anciaux and Yuan (2007), Janic (2007), Kocabasoglu *et al.* (2007), Srivastva (2007), Gandolfo and Sbrana (2008), Quan *et al.* (2008), Sheu (2008), Yu and Hui (2008), Zhao *et al.* (2008), Eltayeb and Zailani (2009), Geng *et al.* (2009), Paksoy *et al.* (2009), Sasikumar and Kannan (2009), Fuente *et al.* (2010), Ninlawan *et al.* (2010), Wang and Hsu (2010), Wang *et al.* (2011)	25

Table II.
Various key themes of GSCM reported in the literature

surveys/empirical studies research methods has been reported highest. Various industries have been considered in the research in the area of GSCM like manufacturing industry, automobile industry, electrical/electronic industry, etc. Summary of industry considered in the research in the area of GSCM reported in the literature has been shown in Table VI.

The frequency of manufacturing industry considered in the research has been reported as the highest.

المنارة للاستشارات

www.mana

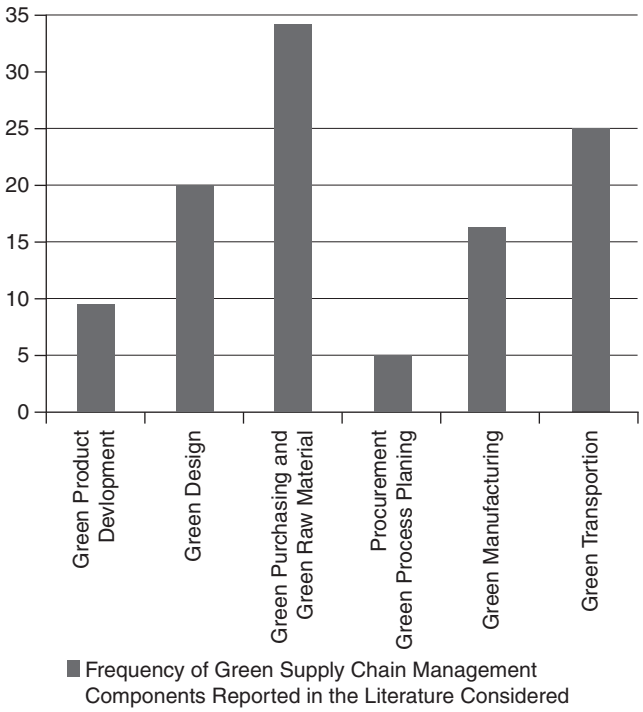

Figure 2.
Frequency of GSCM key themes reported in the literature considered

Implementation of GSCM review: enablers and barriers

Companies striving to "green" their supply chains are mostly constrained by the inability to justify the cost of its implementation. Widening and intensifying green supplier-producer relationships would be beneficial for the environmental sustainability. The literature on implementation of GSCM has been divided into two categories: enablers and barriers as discussed in following sub-sections.

Enablers to implement GSCM review

The work on enablers of GSCM implementation is provided in Table VII.

In Table VII, enablers to implement GSCM practices have been identified by researchers in various industrial applications and countries. Regulations, environment management systems adoption, top management commitment, supplier management, organization involvement and encouragement, customers involvement, social perspective, IT enablement; technology advancement have been identified some important enablers to implement GSCM practices. Environment management systems and top management commitment have been reported as the most repetitively considered enablers to GSCM practices implementation.

Barriers to implement GSCM review

Barriers to implement GSCM practices identified from the literature by researchers for various industry applications and countries have been tabulated in Table VIII. Lack of commitment by top management has been found most repetitive barrier to implement GSCM practices.

المنارة للاستشارات

www.mana

Tool/techniques used (frequency)		Researcher's
Statistical tools and techniques (61)	Factor analysis (21)	Zhu and Sarkis (2004, Zhu *et al.* (2007a, b), Hsu and Hu (2008), Vachon and Klassen (2008), Zhu *et al.* (2007a, b), Chong *et al.* (2009), Eltayeb and Zailani (2009), Eltayeb *et al.* (2009), Cai *et al.* (2010), Hu and Hsu (2010), Lam *et al.* (2010), Shang *et al.* (2010), Wu *et al.* (2010), Yang *et al.* (2010), Zhu *et al.* (2010a, b), Eltayeb *et al.* (2011), Mohammad *et al.* (2011)
	Regression analysis (11)	Pujari *et al.* (2003), Zhu and Sarkis (2004), Zhu and Sarkis (2006), Yu (2007), Salam (2008), Yu and Hui (2008), Wu *et al.* (2010), Yang *et al.* (2010)
	Other statistical techniques (29)	Narasimhan and Das (2001), Wu and Shen (2006), Chien and Shih (2007a, b), Zhu and Sarkis (2007), Hsu and Hu (2008), Salam (2008), Vachon and Klassen (2008), Zhu *et al.* (2008a, b), Chong *et al.* (2009), Eltayeb and Zailani (2009), Eltayeb *et al.* (2009), Holt and Ghobadian (2009), Shen and Saijo (2009), Shukla *et al.* (2009), Hu and Hsu (2010), Lam *et al.* (2010), Mohammad *et al.* (2010), Ninlawan *et al.* (2010), Shang *et al.* (2010), Woofi and Zailani (2010), Zhu *et al.* (2010a, b), Eltayeb *et al.* (2011), Olugu *et al.* (2011), Wang *et al.* (2011), Zhu *et al.* (2011)
Analytic hierarchy process; Fuzzy-AHP (12)		Saaty and Vargas (2000), Handfield *et al.* (2002), Sarkis (2003), Chen *et al.* (2008), Hsu and Hu (2008), Kannan *et al.* (2008), Saaty (2008), Xiangru and Zhang (2008), Kumar *et al.* (2009), Qingkui and Junhu (2009), Wang and Hsu (2010), Zheng (2010)
Interpretive structural modeling (12)		Mandal and Deshmukh (1994), Jharkharia and Shankar (2005), Ravi and Shankar (2005), Sarkis *et al.* (2007), Kannan *et al.* (2008), Singh and Kant (2008), Mudgal *et al.* (2009), Faisal (2010), Mudgal *et al.* (2010), Diabat and Govidan (2011), Luthra *et al.* (2011), Haleem *et al.* (2012)
Fuzzy/neuro –fuzzy (7)		Sarkar and Mohapatra (2006), Nukala and Gupta (2007), Yu *et al.* (2008), Olugu and Wong (2009), Tuzkaya *et al.* (2009), Chen *et al.* (2010), Wang and Hsu (2010)
Analytic network process (5)		Sarkis (2003), Chen *et al.* (2008), Yu (2008), Hsu and Hu (2009), Hung (2010)
Computer programs and software (5)		Tseng *et al.* (2008), Bojarski *et al.* (2009), Chu *et al.* (2009), Dutta *et al.* (2010), Luh *et al.* (2010)
Linear/integer programming (5)		Sheu *et al.* (2005), Sheu (2008), Geng *et al.* (2009), Gosálbez and Grossmann (2010), Paksoy *et al.* (2011)
Game theory (4)		Zhu and Dou (2007), Chen and sheu (2009), Jalali Naini *et al.* (2011), Sheu (2011)
Genetic algorithm (3)		Tseng *et al.* (2008), Chu *et al.* (2009), Yeh and Chang (2011)
Rough set theory (3)		Qingkui and Junhu (2009), Bai and Sarkis (2010a, b)
Structural equation modeling (3)		Chien and Shih (2007a, b), Cai *et al.* (2010)
Balance score card (2)		Chen *et al.* (2008), Jalali Naini *et al.* (2011)
Other methods (13)		Sarkar and Mohapatra (2006), Alhola (2008), Yu (2008), Geng *et al.* (2009), Shen and Saijo (2009), Bai and Sarkis (2010a, b), Fuente *et al.* (2010), Sundarakani *et al.* (2010), Wang and Hsu (2010), Wu and Pagell (2011), Haleem *et al.* (2012), Siddiqui *et al.* (2012)

Table III.
Summary of tool/techniques used in the area GSCM reported in the literature

المنارة للاستشارات

www.mana

Model (frequency)	Researcher's
Conceptual model (30)	Beamon (1999), Narasimhan and Das (2001), Mclaren *et al.* (2004), Roche and Toyne (2004), Torres *et al.* (2004), Udomleartprasert (2004), Beamon (2005), Hervani *et al.* (2005), Wu and Shen (2006), Hosseini (2007), Kocabasoglu *et al.* (2007), Solvang *et al.* (2007), Zhu and Dou (2007), Fuse and Kashima (2008), Gandolfo and Sbrana (2008), Jason Jolley (2008), Molla (2008), Yu *et al.* (2008), Yu (2008), Meyer (2009), Olugu and Wong (2009), Sarkis (2009), Tan and Zailani (2009), Yu and Hu (2009), Gonzales *et al.* (2010), Olugu *et al.* (2010), Woofi and Zailani (2010), Zhu *et al.* (2010a), Parmigiani *et al.* (2011)
Closed loop supply chain model (14)	Guide *et al.* (2003a, b), Solvang *et al.* (2007), Zhao *et al.* (2008), Zhu *et al.* (2008a, b), Guide and Wassenhove (2009), Olugu and Wong (2009), Ferguson and Souza (2010), Wang and Hsu (2010), Paksoy *et al.* (2011), Olugu *et al.* (2011), Ozceylan and Paksoy (2013), Siddiqui *et al.* (2012)
Multi objective optimization model (13)	Sheu *et al.* (2005), Sheu (2008), Bojarski *et al.* (2009), Cruz (2009), Geng *et al.* (2009), Paksoy *et al.* (2011), Cho and Soh (2010), Gosálbez and Grossmann (2010), Wang and Hsu (2010), Wang *et al.* (2011), Yeh and Chang (2011), Chaabane *et al.* (2012), Ozceylan and Paksoy (2013)
Green logistics model (10)	Dullaet *et al.* (2005), Sheu *et al.* (2005), Anciaux and Yuan (2007), Janic (2007), Quan *et al.* (2008), Sheu (2008), Zhao *et al.* (2008), Geng *et al.* (2009), Sundarakani *et al.* (2010), Wang and Hsu (2010)
Supply chain operation reference model (2)	Irfain *et al.* (2008), Hwang *et al.* (2010)

Table IV. Summary for various models of GSCM as reported in the literature

Implementation of GSCM research papers reported in the literature year wise is shown in the Figure 3. An increasing trend of research papers has been reported in the recent years.

Performance measurement review

Performance measurement is how organizations, public and private, measure the quality of their activities and services. Environmental performance is a concern of managers due to reasons ranging from regulatory and contractual compliance, to public perception and competitive advantage (Theyel, 2001).

The performance-research papers reported in the literature year wise is shown in the Figure 4.

Discussions

This paper is an attempt to provide an overview of literature on GSCM issues. An exhaustive literature survey has been carried out and also presented to highlight present state of the art. We have focussed more on the recent papers to review number of issues related to green supply chains and expert's opinions also taken. This has helped us identifying the research gaps in this area. Future areas of research have been identified on the basis of literature gaps and perceptions of the practitioners. GSCM activities have been classified to identify research fields. Six key themes (Green Product Development, Green Design, Green Purchasing and Green Raw Materials Procurement, Green Process Planning, Green Manufacturing and Green Transportation) of GSCM have been identified from the literature synthesis from this area. Different techniques/methodologies such as statistical tools and techniques, analytic hierarchy process, analytic network

المنارة للاستشارات

www.mana

Research methods	Researcher's
Case studies/ surveys/empirical studies (68)	Min and Galle (1997), Motwani *et al.* (1998), Narasimhan and Das (2001), Guide *et al.* (2003a, b), Pujari *et al.* (2003), Mclaren *et al.* (2004), Zhu and Sarkis (2004), Kainuma and Tawara (2006), Vachon and Klassen (2006), Zhu and Sarkis (2006), Chien and Shih (2007a, b), Yu (2007), Kocabasoglu *et al.* (2007), Yu (2007), Zhu and Sarkis (2007), Alhola (2008), Darnall *et al.* (2008), Hsu and Hu (2008), Irfain *et al.* (2008), Salam (2008), Vachon and Klassen (2008), Yu and Hui (2008), Zhu *et al.* (2008a, b), Chong *et al.* (2009), Eltayeb and Zailani (2009), Eltayeb *et al.* (2009), Holt and Ghobadian (2009), Hsu and Hu (2009), Mohammed *et al.* (2009a), Mudgal *et al.* (2009), Seuring (2009), Shen and Saijo (2009), Shukla *et al.* (2009), Wu *et al.* (2010), Auger *et al.* (2010), Bai and Sarkis (2010a, b), Cai *et al.* (2010), Chen *et al.* (2010), Faisal (2010), Hu and Hsu (2010), Lam *et al.* (2010), Mohammad *et al.* (2010), Mudgal *et al.* (2010), Ninlawan *et al.* (2010), Nunes and Bennett (2010), Olugu *et al.* (2010), Shang *et al.* (2010), Woofi and Zailani (2010), Yang *et al.* (2010), Zhu *et al.* (2010a, b), Diabat and Govidan (2011), Eltayeb *et al.* (2011), Jalali Naini *et al.* (2011), Lun (2011), Mohammad *et al.* (2011), Olugu *et al.* (2011), Wang *et al.* (2011), Zhu *et al.* (2011), Chaabane *et al.* (2012), Siddiqui *et al.* (2012)
Mathematical and OR-based models (30)	Hendrickson and Tuttle (1997), Handfield *et al.* (2002), Sarkis (2003), Dullaet *et al.* (2005), Ravi and Shankar (2005), Sheu *et al.* (2005), Hu (2006), Anciaux and Yuan (2007), Bojarski *et al.* (2009), Janic (2007), Sheu (2008), Tseng *et al.* (2008), Chen and sheu (2009), Cruz (2009), Geng *et al.* (2009), Guide and Wassenhove (2009), Qingkui and Junhu (2009), Tuzkaya *et al.* (2009), Yu and Hu (2009), Cheng and Wei (2010), Cho and Soh (2010), Sundarakani *et al.* (2010), Wang and Hsu (2010), Paksoy *et al.* (2011), Sheu (2011), Sundarakani *et al.* (2010), Wang *et al.* (2011), Yeh and Chang (2011), Ozceylan and Paksoy (2013)
Interviews (10)	Digalwar and Metri (2004), Xiangru and Zhang (2008), Mohammed *et al.* (2009a), Shukla *et al.* (2009), Luthra *et al.* (2010), Zhu *et al.* (2010a, b), Luthra *et al.* (2011), Wu and Pagell (2011)
Others (28)	Gungor and Gupta (1999), Handfield and Nichols (1999), Dowlatshahi (2000), Chopra and Meindl (2001), Krause *et al.* (2001), Zsidisin and Siferd (2001), Stevels (2002), Guide and Wassenhove (2009), Roche and Toyne (2004), Torres *et al.* (2004), Duber-Smith (2005), Davies and Hochman (2007), Linton *et al.* (2007), Srivastva (2007), Gandolfo and Sbrana (2008), Rettab and Ben Brik (2008), Seuring and Muller (2008), Simpson and Samson (2008), Forte (2009), Ho *et al.* (2009), Ortiz *et al.* (2009), PaneHaden *et al.* (2009), Sarkis (2009), Sasikumar and Kannan (2009), Seuring (2009), Siddiqui *et al.* (2009), Fuente *et al.* (2010), Ilgin and Gupta (2010)

Table V.
Summary of research methods in the area of GSCM reported in the literature

process, fuzzy, fuzzy-analytic hierarchy process and interpretive structural modeling, etc. have been identified to be used to model, analyze and support decision making. The literatures have been classified on the basis of models (conceptual model, closed loop supply chain model, multi objective optimization model and green logistic model) of GSCM for optimization of efficiency and research methods like (case studies/surveys/empirical studies, mathematical and OR-based models and interviews and other methods). Extensive literature review has been carried out to identify enablers and barriers in implementation of GSCM in an organization. Environmental management system and top management commitment have been found as repetitive enablers and lack of top management commitment as barrier. Performance measurement in GSCM reported in the literature has been complied in tabular form.

المنارة للاستشارات

www.mana

Industry considered in the research	Researcher's
Manufacturing industry (26)	Min and Galle (1997), Motwani *et al.* (1998), Narasimhan and Das (2001), Sarkis *et al.* (2007), Zhu and Sarkis (2007), Zhu and Sarkis (2007), Holt and Ghobadian (2009), Rettab and Ben Brik (2008), Zhu *et al.* (2008a, b), Eltayeb and Zailani (2009), Eltayeb *et al.* (2009), Ho *et al.* (2009), Mudgal *et al.* (2009), Tan and Zailani (2009), Cai *et al.* (2010), Faisal (2010), Mohammad *et al.* (2010), Mudgal *et al.* (2010), Zheng (2010), Zhu *et al.* (2010a, b), Diabat and Govidan (2011), Eltayeb *et al.* (2011), Jalali Naini *et al.* (2011), Zhu *et al.* (2011)
Electronic/electrical industry (15)	Mclaren *et al.* (2004), Udomleartprasert (2004), Zhu and Sarkis (2004), Zhu and Sarkis (2006), Chien and Shih (2007a, b), Hsu and Hu (2008, 2009), Cai *et al.* (2010), Chong *et al.* (2009), Dutta *et al.* (2010), Hu and Hsu (2010), Ninlawan *et al.* (2010), Yang *et al.* (2010), Mohammad *et al.* (2011)
Automobile industry (14)	Zhu and Sarkis (2004), Ravi and Shankar (2005), Zhu and Sarkis (2006, 2007), Fuse and Kashima (2008), Xiangru and Zhang (2008), Shukla *et al.* (2009), Cai *et al.* (2010), Gonzales *et al.* (2010), Nunes and Bennett (2010), Olugu *et al.* (2010), Luthra *et al.* (2011), Mohammad *et al.* (2011), Olugu *et al.* (2011)
Construction industry (8)	Rettab and Ben Brik (2008), Ho *et al.* (2009), Meyer (2009), Mohammed *et al.* (2009a, b), Ortiz *et al.* (2009), Lam *et al.* (2010), Mohammad *et al.* (2011)
IT industry (4)	Jharkharia and Shankar (2005), Molla (2008), Wu *et al.* (2010), Wu and Pagell (2011)
Power generating industry (3)	Zhu and Sarkis (2004, 2006), Mohammad *et al.* (2011)
Chemical industry (2)	Zhu and Sarkis (2004), Gosálbez and Grossmann (2010)
Logistic industry (2)	Yu (2007), Yu and Hui (2008)
Package printing industry(2)	Vachon and Klassen (2006, 2008),
Others (13)	Zhu and Sarkis (2004), Hosseini (2007), Alhola (2008), Rettab and Ben Brik (2008), Ho *et al.* (2009), Tan and Zailani (2009), Cai *et al.* (2010), Woofi and Zailani (2010), Diabat and Govidan (2011), Lun (2011), Mohammad *et al.* (2011), Wu and Pagell (2011), Siddiqui *et al.* (2012)

Table VI.
Summary of industry considered in the research in the area of GSCM reported in the literature

Conclusions

Organizations have multiple objectives like enhanced brand image, competitiveness, better resources utilization, better customer service and increased profitability, etc. To achieve these objectives organizations employ various defensive as well as offensive business strategies. GSCM may be a good way to balance the environmental, economic and social benefits (Diabat and Govidan, 2011). GSCM practices are already mature in some developed countries but GSCM is still a relatively new issue for most of the developing countries. In recent years, there is a significant increase in the number of studies on environment issues in national and international journals. The relevant literature on GSCM has been reviewed and reported in this paper. The literatures of all functional areas of GSCM have been discussed. The frequency of key themes of GSCM reported in the literature has been plotted. Two key themes named green product development and green process planning reported low frequency while comparing to other key themes of GSCM. Very less work has reported on use of techniques like genetic algorithm, rough set theory, structural equation modeling, balance score card and interpretive ranking process (IRP) as compared to other techniques in GSCM modeling and optimization. The works reported in the literature on closed loop supply

المنارة للاستشارات

www.mana

Table VII.
Enablers to implement GSCM reported in the literature (in chronological order)

Sl. no.	Enablers to implement GSCM identified in the literature	Application; industry in which implemented; country	Researcher's
1	Material, process, packaging, working environment and waste system	GSCM; electronic industry	Udomleartprasert (2004)
2	Environmental regulations, government environmental policy, international environmental agreements, suppliers, customers and community stakeholders	GSCM; electrical and electronics industry, Taiwan	Chien and Shih (2007a, b)
3	Pollution prevention, cleaner or environment friendly technology, closed loop manufacturing, reuse and recycling of the product and EMS adoption	Green management; transport ministry; Iran	Hosseini (2007)
4	Technology, organization and environment	GSCM; logistics industry; Taiwan	Yu (2007)
5	Environmental management system	GSCM	Darnall *et al.* (2008)
6	Supplier management, product recycling, organization involvement and life cycle management	GSCM; electronic industry; Taiwan	Hsu and Hu (2008)
7	Environment management systems	-	Jason Jolley (2008)
8	Explicitness of technology, accumulation of technology, organizational encouragement, quality of human resources, environmental uncertainty and government support	Green innovations; logistics industry; Taiwan	Yu and Hui (2008)
9	Internal environmental management, green purchasing, cooperation with customers including environmental requirements, eco design and investment recovery	GSCM; power generating, chemical/petroleum, electrical/electronic and automobile industry; china	Zhu *et al.* (2008a, b)
10	Corporate social responsibility (CSR)	SSCM	Cruz (2009)
11	Environmental attitude (EA)	GSCM; Manufacturing Sector; U.K.	Holt and Ghobadian (2009)
12	Top management commitment, societal concern for protection of natural environment, government policies and regulations, eco-literacy amongst supply chain partners, customer satisfaction through environmental performance, certification to ISO: 14001 EMS, proper workplace management: housekeeping practices, green product development, green procurement practices, availability of clean technology, lean manufacturing practice, economic interests, eco-labeling of products, reverse logistics and competitiveness	GSCM; Manufacturing Sector; India	Mudgal *et al.* (2009)
13	Information sharing and information quality	GSCM; IT industry; Taiwan	Wu *et al.* (2010)
14	Information sharing, strategic planning, consumer concern towards sustainable practices, collaborative relationships, metrics to quantify sustainability benefits in a SC, regulatory framework, support to partners in the SC, top management commitment, awareness about sustainable practices in SC and availability of funds	Sustainable development in supply chain; Gulf Region	Faisal (2010)

(*continued*)

المنارة للاستشارات

www.mana

Sl. no.	Enablers to implement GSCM identified in the literature	Application; industry in which implemented; country	Researcher's
15	Logical rules and regulations, an effective information system and a developed general conscience of the people	GSCM	Hossein hojjati and Jahangiri (2010)
16	Supplier management, Product recycling, Organization involvement and Life cycle management	GSCM; electronics and electrical industry; Taiwan	Hu and Hsu (2010)
17	Corporate, government and peoples	GSCM; India	Luthra *et al.* (2010)
18	Green technology and techniques, reliability and quality specifications, leadership and responsibilities, involvement by the stakeholders and guide and benchmarking systems	Green specification; construction	Lam *et al.* (2010)
19	Regulations, market, export, customer awareness, supplier relation, skilful policy entrepreneurs, desire to reduce cost, investor pressure, quality improvement and employee involvement	GSCM; SMEs; India	Mohammad *et al.* (2010)
20	Internal environment management, green purchasing, customer cooperation with environmental considerations, eco-design and investment recovery	GSC practices; nine large manufacturers; Japan	Zhu *et al.* (2010b)
21	Certification of suppliers environmental management system, environmental collaboration with suppliers, collaboration between product designer and supplier to reduce and eliminate product environmental impacts, governmental regulations and legalization, green design, ISO 14001 certification, integrating quality environmental management in to planning and operation process, reducing energy consumption, reusing and recycling materials and packaging, environmental collaboration with customers and reverse logistics	GSCM; aluminum industry; India	Diabat and Govidan (2011)
22	Eco design, green purchasing, reverse logistics	GSC initiatives and outcomes; manufacturing industry; Malaysia	Eltayeb *et al.* (2011)
23	Internal drivers, market drivers, social drivers, economic drivers and regulatory drivers	GSCM; manufacturing industry; India	Mohammad *et al.* (2011)
24	Satisfaction of internal customers, health management of employees, use of information system in TQM, excellent top management, reductions in energy consumption and waste minimization, flexible computer-integrated manufacturing systems, adequate and poka-yoke quality, continuous improvements in the process, rewards and incentives, responsiveness of supply chain	WCM; manufacturing industry; India	Haleem *et al.* (2012)

Table VII.

المنارة للاستشارات

www.mana

Table VIII.
Barriers to implement GSCM reported in the literature (in chronological order)

S.N.	Barriers to implement GSCM identified in the literature	Application; industry in which implemented; country	Researcher's
1	Lack of information and technological systems, problems with product quality, company policies, resistance to change to reverse logistics, lack of appropriate performance metrics, lack of training and education, financial constraints, lack of commitment by top management, lack of awareness about reverse logistics, lack of strategic planning and reluctance of the support of dealers, distributors and retailers	Reverse logistics; automobile industry; India	Ravi and Shankar (2005)
2	Inappropriate evaluation and appraisal approaches, lack of methodologies and processes to enhance environmentally conscious manufacturing, resistance to organizational change, difficulty in integrating life cycle analysis items in to environmentally conscious manufacturing, insufficient training, education and reward systems, difficulties with environmental technology, limited intra-organizational support, poor supply chain partnership formation, poor design for environment interfaces, poor incorporation of environmental measures in to decision making and lack of top management support and commitment	ECM; manufacturing industry; China	Sarkis *et al.* (2007)
3	Cost and lack of legitimacy, regulation, poor supplier commitment and industry specific	GSCM; private and public sector organizations	Walker *et al.* (2008)
4	Financial constraints, lack of legitimacy, company policies, Lack of training and education, lack of commitment by top management, regulation, poor supplier commitment, industry specific disablers, corruption/bureaucracy and lack of customer awareness	GSCM; SMEs; India	Mohammad *et al.* (2010)
5	Lack of commitment from top management inadequate adoption of reverse logistics practices, lack of eco literacy among supply chain partners, lack of corporate social responsibility, lack of market demand, lack of preparedness on part of suppliers, inadequate strategic planning, lack of appropriate environmental performance metrics, Lack of integrated information system, lack of support and guidance's from regulatory authorities, non-adoption of cleaner technology, low level of supply chain integration, resistance to change and adopt innovation, financial constraints and restrictive company policies towards product/process stewardship	GSC practices; manufacturing industry, India	Mudgal *et al.* (2010)
6	Lack of eco-design, lack of green purchasing, lack of reverse logistics, attitudinal and perceptions barriers, information related barriers, technical barriers and resource barriers	GSC initiatives; SMEs; Malaysia	Woofi and Zailani (2010)
7	Lack of IT implementation, resistance to technology advancement adoption, lack of organization encouragement, poor quality of human resources, market competition and uncertainty, lack of government support system, lack of implementing green practices, lack of top management commitment, cost implications, supplier reluctance to change towards GSCM and unawareness of customers	GSCM; automobile industry, India	Luthra *et al.* (2011)

المنارة للاستشارات

www.mana

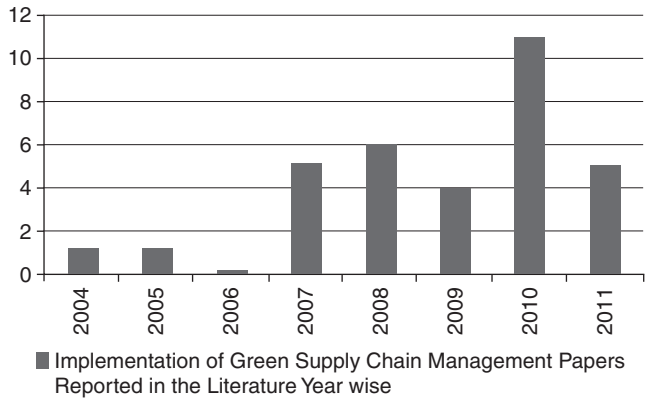

Figure 3.
Implementation of GSCM papers reported in the literature year wise

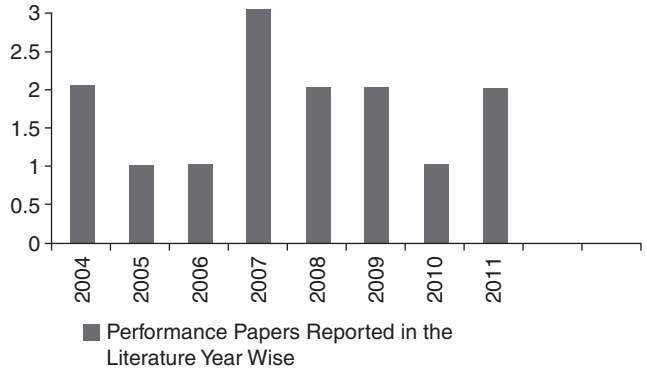

Figure 4.
Performance related papers as reported in the literature year wise

chain models are conceptual in the nature. Less work has been attempted on green logistic models and supply chain operation reference models.

E-waste in IT industry, disposal of hazardous waste in chemical industry, optimization of routes and alternative green fuels in logistic industry, disposal of ash and air pollution in thermal power generating industry, recyclability of tins and waste in food industry, cutting of trees for furniture industry and non-degradable dies in textile industry may be some areas to be explored. Though some work has been reported in the literature, GSCM implementation and GSC performance evaluation needs to be explored further. Most of performance models reported in the literature are theoretical. An increasing trend of research literature has been observed on GSCM practices implementation and performance measurement in recent years. It suggests need for maturation of these topics and field with great scope for future study. Very few studies have been reported from customer perspective in literature. It has been reported that organization-awareness level toward GSCM practices implementation is very low. Literature has repeatedly indicated the importance of top management commitment in implementation of GSCM practices. This provides deeper insights for those managers investigating the concept of GSCM and help managers/practitioners improve their understanding of GSCM practices. It will enable decision makers to assess the perception of GSCM in their organization. It is hoped that this work may act as a catalyst in compressing the learning curve with respect to research methods

المنارة للاستشارات

www.mana

practices in GSCM and this paper may well serve as a good foundation for broadening research in area of GSCM.

Future research directions

The following directions for future research may be drawn from our literature review:

- In the course of reviewing key themes reported in the literature, it has been observed that there are lot of research opportunities for a researcher's in GSCM key themes toward implementation. Much research is needed to support toward greening along the entire supply chain. Very less work has been reported in. There is a strong need to explore the two key themes namely green product development and green process planning.
- It has been also reported that the techniques like SEM and IRP have been used very rarely to validate the implementation models. So, research could be undertaken to develop newer means of validating GSCM implementation models already developed.
- Less work has been observed in the area of closed loop supply chains. More research is needed in understanding reverse logistics toward closing the loop.
- It has been also found from review of literature that some environment conscious sectors like power sector, construction sector, automobile sectors and some other sectors are lagging far behind manufacturing and electrical and electronic industry in GSCM practices implementation. Especially, automobile industry in India is one of the proposed key research areas for GSCM practices implementation GSCM practices implementation and performance evaluation needs to be explored in Indian context. Some work has been reported in the literature but most of the performance evaluation models are theoretical ones.
- Very less work has been reported in the literature on the role of customers in greening the supply chain. Thus, it needs to be explored further. Researchers may focus on studies for increasing organization-awareness level on environmental problems that are caused by their business operations. Organization-awareness level will provide positive results with regard to environmental and social sustainability of organizations.
- Researchers need to focus on industry-specific evaluation models for measuring GSCM performance improvements.

References

Alhola, K.P. (2008), "Promoting environmentally sound furniture by green public procurement", *Ecological Economics*, Vol. 68 Nos 1/2, pp. 472-485.

Anciaux, D. and Yuan, K. (2007), "Green supply chain: intermodal transportation modeling with environmental impacts", *Proceedings of Association of European Transport and Contributors*, pp. 1-10.

Auger, P., Devinney, T.M., Louviere, J.J. and Burke, P.F. (2010), "The importance of social product attributes in consumer purchasing decisions: a multi-country comparative study", *International Business Review*, Vol. 19 No. 2, pp. 140-159.

Bai, C. and Sarkis, J. (2010a), "Green supplier development: analytical evaluation using rough set theory", *Journal of Cleaner Production*, Vol. 18 No. 12, pp. 1200-1210.

المنارة للاستشارات

www.mana

Bai, C. and Sarkis, J. (2010b), "Integrating sustainability into supplier selection with grey system and rough set methodologies", *International Journal of Production Economics*, Vol. 12 No. 4, pp. 252-264.

Beamon, B.M. (1999), "Designing the green supply chain", *Logistics Information Management*, Vol. 12 No. 4, pp. 332-342.

Beamon, B.M. (2005), "Environmental and sustainability ethics in supply chain management", *Science Engineering Ethics*, Vol. 11 No. 2, pp. 221-234.

Bojarski, A.D., Laínez, J.M., Espuna, A. and Puigjaner, L. (2009), "Incorporating environmental impacts and regulations in a holistic supply chains modeling: an LCA approach", *Computers and Chemical Engineering*, Vol. 33 No. 10, pp. 1747-1759.

Cai, S., Jun, M. and Yang, Z. (2010), "Implementing supply chain information integration in China: the role of institutional forces and trust", *Journal of Operations Management*, Vol. 28 No. 3, pp. 257-268.

Chaabane, A., Ramudhin, A. and Paquet, M. (2012), "Design of sustainable supply chains under the emission trading scheme", *International Journal of Production Economics*, Vol. 135 No. 1, pp. 37-49.

Chen, C.C., Tseng, M.L., Lin, Y.H. and Lin, Z.S. (2010), "Implementation of green supply chain management in uncertainty", *Proceedings of the 2010 IEEE IEEM*, Vol. 1 No. 10, pp. 260-264.

Chen, H.H., Kang, H.Y., Xing, X.O., Lee, A.M.I. and Tong, Y.H. (2008), "Developing new products with knowledge management methods and process development management in a network", *Computers in Industry*, Vol. 59 Nos 2/3, pp. 242-253.

Chen, Y.J. and Sheu, J.B. (2009), "Environmental-regulation pricing strategies for green supply chain management", *Transport Research Part E*, Vol. 45 No. 5, pp. 667-677.

Cheng, C. and Wei, C. (2010), "Economics of cost of quality for green manufacturing life cycle assessment approach", PhD dissertation, Texas Technical University, Lubbock, TX, May, pp. 1-174.

Chien, M.K. and Shih, L.H. (2007a), "An empirical study of the implementation of green supply chain management practices in the electrical and electronics industries and their relation to organizational behavior", *International Journal of Science and Technology*, Vol. 4 No. 3, pp. 383-394.

Chien, M.K. and Shih, L.H. (2007b), "Relationship between management practice and organization performance under European Union directives such as ROHS, a case study on the electrical and electronics industry in Taiwan", *African Journal of Environmental Science and Technology*, Vol. 1 No. 3, pp. 37-48.

Cho, G. and Soh, S. (2010), "Optimal decision making for supplier-buyer's maximum profit in a two echelon's supply chain", *African Journal of Business Management*, Vol. 4 No. 5, pp. 687-694.

Chong, A.Y.L., Ooi, K.B. and Sohal, A. (2009), "The relationship between supply chain factors and adoption of e-Collaboration tools: an empirical examination", *International Journal of Production Economics*, Vol. 122 No. 2, pp. 150-160.

Chopra, S. and Meindl, S. (2001), *Supply Chain Management: Strategy, Planning, and Operation*, Prentice Hall of India, New Delhi.

Chu, C.H., Luh, Y.P., Li, T.C. and Chen, H. (2009), "Economical green product design based on simplified computer-aided product structure variation", *Computers in Industry*, Vol. 60 No. 7, pp. 485-500.

Chung, C.J. and Wee, H.M. (2008), "Green-component life-cycle value on design and reverse manufacturing in semi-closed supply chain", *International Journal of Production Economics*, Vol. 113 No. 2, pp. 528-545.

المنارة للاستشارات

www.mana

Chung, C.J. and Wee, H.M. (2011), "Short life-cycle deteriorating product remanufacturing in a green supply chain inventory control system", *International Journal of Production Economics*, Vol. 129 No. 1, pp. 195-203.

Cooper, J. (1994), *Green Logistics, European Logistics: Markets, Management and Strategy*, Blackwell Business, London and Oxford.

Cruz, J.M. (2009), "The impact of corporate social responsibility in supply chain management: multi criteria decision-making approach", *Decision Support Systems*, Vol. 48 No. 1, pp. 224-236.

Darnall, N., Jolley, G.J. and Handfield, R. (2008), "Environmental management systems and green supply chain management: complements for sustainability?", *Journal of Business Strategy and the Environment*, Vol. 1 No. 8, pp. 30-45.

Davies, J. and Hochman, S. (2007), "The greening of the supply chain", *Supply Chain Management Review*, Vol. 11 No. 5, pp. 13-14.

Diabat, A. and Govidan, K. (2011), "An analysis of the drivers affecting the implementation of green supply chain management", *Resources, Conservation and Recycling*, Vol. 55 No. 6, pp. 659-667.

Digalwar, A.K. and Metri, B.A. (2004), "Performance measurement framework for world class manufacturing", *International Journal of Applied Management and Technology*, Vol. 3 No. 2, pp. 83-101.

Dowlatshahi, S. (2000), "Developing a theory of reverse logistics", *Interfaces*, Vol. 30 No. 3, pp. 143-155.

Duber-Smith, D.C. (2005), "The green imperative", *Soap, Perfumery, and Cosmetics*, Vol. 78 No. 8, pp. 24-26.

Dullaet, W., Maes, B., Cernimmen, B. and Witlox, F. (2005), "An evolutionary algorithm for order splitting with multiple transport alternatives", *Expert Systems with Applications*, Vol. 28 No. 2, pp. 201-208.

Dutta, F.T., Trappey, A.J. and Trappey, C.V. (2010), "An XML based supply chain integration hub for green product lifecycle management", *Expert Systems with Applications*, Vol. 37 No. 1, pp. 7319-7328.

Easterby-Smith, M., Thorpe, R. and Lowe, A. (2002), *Management Research – An Introduction*, Sage Publications, London.

Eltayeb, T.K. and Zailani, S. (2009), "Going green in supply chain towards environmental sustainability", *Global Journal of Environmental Research*, Vol. 3 No. 3, pp. 246-251.

Eltayeb, T.K., Zailani, S. and Jayaraman, K.S. (2009), "The examination on the drivers for green purchasing adoption among EMS 14001 certified companies in Malaysia", *Journal of Manufacturing Technology Management*, Vol. 21 No. 2, pp. 206-225.

Eltayeb, T.K., Zailani, S. and Ramayah, T. (2011), "Green supply chain initiatives among certified companies in Malaysia and environmental sustainability: investigating the outcomes", *Resources, Conservation and Recycling*, Vol. 55 No. 5, pp. 495-506.

Faisal, M.N. (2010), "Sustainable supply chains: a study of interaction among the enablers", *Business Process Management Journal*, Vol. 16 No. 3, pp. 508-529.

Ferguson, M. and Souza, G.C. (2010), *Closed-Loop Supply Chains: New Developments to Improve the Sustainability of Business Practices*, CRC Press, Taylor & Francis, Boca Raton, FL.

Forte, J. (2009), "Green supply chain management: a literature review", *Otago Management Graduate Review*, Vol. 7 No. 1, pp. 51-62.

Fuente, M.V., Ros, L. and Ortiz, A. (2010), "Enterprise modeling methodology for forward and reverse supply chain flows integration", *Computers in Industry*, Vol. 61 No. 7, pp. 702-710.

المنارة للاستشارات

www.mana

Fuse, M. and Kashima, S. (2008), "Evaluation method of automobile recycling systems for Asia considering international material cycles: application to Japan and Thailand", *Journal of Mater Cycles Waste Management*, Vol. 10 No. 2, pp. 153-164.

Gandolfo, A. and Sbrana, R. (2008), "Reverse logistics and market-driven management", © *SYMPHONYA Emerging Issues in Management*, pp. 1-13, available at: www.unimib.it/symphonya (accessed May 12, 2012).

Geng, X., Wang, Y. and Sun, C. (2009), "A distribution reverses logistics model design based on green supply chain management", *Proceedings of the 2009 IEEE IEEM*, Vol. 8 No. 9, pp. 1763-1766.

Gilbert, S. (2000), "Greening supply chain: enhancing competitiveness through green productivity", *Report of the Top Forum on Enhancing Competitiveness through Green Productivity held in the Republic of China, Taipei, May 25-27,* ISBN: 92-833-2290-8.

Godfrey, R. (1998), "Ethical purchasing: developing the supply chain beyond the environmental", in Russel, T. (Ed.), *Greener Purchasing: Opportunities and Innovations*, Greenleaf Publishing, Sheffield, pp. 244-251.

Gonzales, J., Sakundarini, N., Ariffin, R. and Taha, Z.B. (2010), "Integrated eco-design tool for Malaysian automobile industry", *Journal of Advanced Computational Intelligence and Intelligent Informatics*, Vol. 14 No. 1, pp. 46-47.

Gosálbez, G.G. and Grossmann, I. (2010), "A global optimization strategy for the environmentally conscious design of chemical supply chains under uncertainty in the damage assessment model", *Computers and Chemical Engineering*, Vol. 34 No. 1, pp. 42-58.

Green, K., Morton, B. and New, S. (1996), "Purchasing and environmental management: interactions, policies and opportunities", *Business Strategy and the Environment*, Vol. 5 No. 3, pp. 188-197.

Guide, V.D.R. and Wassenhove, L.N.V. (2009), "The evolution of closed-loop supply chain research", *Operations Research*, Vol. 57 No. 1, pp. 10-18.

Guide, V.D.R. Jr, Jayaraman, V. and Linton, J.D. (2003a), "Building contingency planning for closed-loop supply chains with product recovery", *Journal of Operations Management*, Vol. 21 No. 3, pp. 259-279.

Guide, V.D.R. Jr, Harrison, T.P. and Wassenhove, L.N.V. (2003b), "The challenge of closed-loop supply chains", *Interfaces*, Vol. 3 No. 6, pp. 3-6.

Gungor, A. and Gupta, S.M. (1999), "Issues in environmentally conscious manufacturing and product recovery: a survey", *Computers & Industrial Engineering*, Vol. 36 No. 4, pp. 811-853.

Haleem, A., Sushil, Mohammad, Q.A. and Kumar, S. (2012), "Analysis of critical success factors of world class manufacturing practices: an application of interpretative structural modeling and interpretative ranking process", *Production Planning and Control: The Management of Operations*, Vol. 23 Nos 10/11, pp. 722-734.

Handfield, R., Steven, V.W., Sroufe, R. and Melnyk, S.A. (2002), "Applying environmental criteria to supplier assessment: a study in the application of the Analytical Hierarchy Process", *European Journal of Operational Research*, Vol. 141 No. 1, pp. 70-87.

Handfield, R.B. and Nichols, E.L. (1999), *Introduction to Supply Chain Management*, Prentice-Hall, New Jersey, NJ.

Hendrickson, L.U. and Tuttle, D.B. (1997), "Dynamic management of the environmental enterprise: a qualitative analysis", *Journal of Organizational Change Management*, Vol. 10 No. 4, pp. 363-382.

Hervani, A.A., Helms, M.M. and Sarkis, J. (2005), "Performance measurement for green supply chain management", *Benchmarking: An International Journal*, Vol. 12 No. 4, pp. 330-353.

Ho, J.C., Shalishali, M.K., Tseng, T.L. and Ang, D.S. (2009), "Opportunities in green supply chain management", *The Coastal Business Journal*, Vol. 8 No. 1, pp. 18-31.

المنارة للاستشارات

www.mana

Holt, D. and Ghobadian, A. (2009), "An empirical study of green supply chain management practices amongst UK manufacturers", *Journal of Manufacturing Technology Management*, Vol. 20 No. 7, pp. 933-966.

Hossein hojjati, S.M. and Jahangiri, M. (2010), "Three essential factors toward achievement of green supply chain environment", *Proceedings of the 2010 IEEE ICMIT*, Vol. 5 No. 10, pp. 135-139.

Hosseini, A. (2007), "Identification of green management of system's factors: a conceptualized model", *International Journal of Management Science and Engineering Management*, Vol. 2 No. 3, pp. 221-228.

Hsu, C.W. and Hu, A.H. (2008), "Green supply chain management in the electronic industry", *International Journal of Science and Technology*, Vol. 5 No. 2, pp. 205-216.

Hsu, C.W. and Hu, A.H. (2009), "Applying hazardous substance management to supplier selection using the analytic network process", *Journal of Cleaner Production*, Vol. 17 No. 2, pp. 255-264.

Hu, A.H. and Hsu, C.W. (2010), "Critical factors for implementing green supply chain management practice-an empirical study of electrical and electronics industries in Taiwan", *Management Research Review*, Vol. 33 No. 6, pp. 586-608.

Hu, J. (2006), "Balance of product greening cost and benefit", *IEEE Conferences*, Vol. 6 No. 1, pp. 1146-1150.

Humphreys, P.K., Wong, Y.K. and Chan, F.T.S. (2003), "Integrating environmental criteria into the supplier selection process", *Journal of Materials Processing Technology*, Vol. 138 Nos 1/3, pp. 349-356.

Hung, S.J. (2010), "Activity-based divergent supply chain planning for competitive advantage in the risky global environment: a DEMATEL-ANP fuzzy goal programming approach", *Expert Systems with Applications*, Vol. 37 No. 12, pp. 7545-7554.

Hwang, Y.D., Wen, Y.F. and Chen, M.C. (2010), "A study on the relationship between the PDSA cycle of green purchasing and the performance of the SCOR model", *Total Quality Management & Business Excellence*, Vol. 21 No. 12, pp. 1261-1278.

Ilgin, M.A. and Gupta, S.M. (2010), "Environmentally conscious manufacturing and product recovery: a review of the state of the art", *Journal of Environmental Management*, Vol. 91 No. 3, pp. 563-591.

Irfain, D., Xiaafei, X. and Shong, C.D. (2008), "A SCOR reference model of the supply chain management system in an enterprise", *The Arab Journal of Information Technology*, Vol. 5 No. 3, pp. 288-295.

Jalali Naini, S.G., Aliahmadi, R.Z. and Eskandari, M.J. (2011), "Designing a mixed performance measurement system for environmental supply chain management using evolutionary game theory and balanced scorecard: a case study of an auto industry supply chain", *Resource Conservation and Recycling*, Vol. 55 No. 6, pp. 593-601.

Janic, M. (2007), "Modeling the full costs of an intermodal and road freight transport network", *Transportation Research, Part D*, Vol. 12 No. 1, pp. 33-44.

Jason Jolley, G. (2008), "Green supply chain management practices complement EMS systems", *Sustainable Enterprise Quarterly*, Vol. 5 No. 1, pp. 1-2.

Jharkharia, S. and Shankar, R. (2005), "IT enablement of supply chains: understanding the barriers", *Journal of Enterprise Information Management*, Vol. 18 No. 1, pp. 11-27.

Kainuma, Y. and Tawara, N. (2006), "A multiple attribute utility theory approach to lean and green supply chain management", *International Journal of Production Economics*, Vol. 101 No. 1, pp. 99-108.

Kannan, G., Noorul, H.A., Sasikumar, P. and Arrununchchalam, S. (2008), "Analysis and selection of green suppliers using interpretive structural modeling and analytic

المنارة للاستشارات

www.mana

hierarchy process", *International Journal of Management and Decision Making*, Vol. 9 No. 2, pp. 163-182.

Kocabasoglu, C., Prahinski, C. and Klassen, R.D. (2007), "Linking forward and reverse supply chain investments: the role of business uncertainty", *Journal of Operations Management*, Vol. 25 No. 6, pp. 1141-1160.

Krause, D.R., Pagell, M. and Curkovic, S. (2001), "Toward a measure of competitive priorities for purchasing", *Journal of Operations Management*, Vol. 19 No. 4, pp. 497-512.

Kroon, L. and Virjens, G. (1995), "Returnable containers: an example of reverse logistics", *International Journal of Physical Distribution & Logistics Management*, Vol. 25 No. 2, pp. 56-68.

Kumar, S., Parashar, N. and Haleem, A. (2009), "Analytical hierarchy process applied to vendor selection problem: small scale, medium scale and large scale industries", *Business Intelligence Journal*, Vol. 2 No. 2, pp. 355-362.

Lam, P.T.I., Chan, E.H.W., Poon, C.K. and Chun, K.P. (2010), "Factors affecting the implementation of green specifications in construction", *Journal of Environmental Management*, Vol. 91 No. 3, pp. 654-661.

Lamming, R. and Hampson, J. (1996), "The environmental as a supply chain management issue", *British Journal of Management*, Vol. 7 No. S1, pp. 45-62.

Lettice, F., Wyatt, C. and Evan, S. (2010), "Buyer-supplier partnerships during product design and development in the global automotive sector: who invests in what and when", *International Journal of Production Economics*, Vol. 127 No. 2, pp. 309-319.

Linton, J.D., Klassen, R. and Jayaraman, V. (2007), "Sustainable supply chains: an introduction", *Journal of Operations Management*, Vol. 25 No. 6, pp. 1075-1082.

Luh, Y.N., Chu, C.H. and Pan, C.C. (2010), "Data management of green product development with generic modularized product architecture", *Computers in Industry*, Vol. 61 No. 3, pp. 223-234.

Lun, Y.H.V. (2011), "Green management practices and firm performance: a case of container terminal operations", *Resources, Conservation and Recycling*, Vol. 55 No. 6, pp. 559-566.

Luthra, S., Kumar, V., Kumar, S. and Haleem, A. (2010), "Green supply chain management issues: a literature review approach", *Journal of Information, Knowledge and Research in Mechanical Engineering*, Vol. 1 No. 1, pp. 12-20.

Luthra, S., Kumar, V., Kumar, S. and Haleem, A. (2011), "Barriers to implement green supply chain management in automobile industry using interpretive structural modeling technique-an Indian perspective", *Journal of Industrial Engineering and Management*, Vol. 4 No. 2, pp. 231-257.

Mandal, A. and Deshmukh, S.G. (1994), "Vendor selection using interpretive structural modeling (ISM)", *International Journal of Operations and Production Management*, Vol. 14 No. 6, pp. 52-59.

Meredith, J. (1993), "Theory building through conceptual methods", *International Journal of Operations & Production Management*, Vol. 13 No. 5, pp. 3-11.

Meyer, C. (2009), "The greening of the concrete industry", *Cement & Concrete Composites*, Vol. 31 No. 8, pp. 601-605.

Min, H. and Galle, W.P. (1997), "Green purchasing strategies: trends and implications", *International Journal of Purchasing and Materials Management*, Vol. 33 No. 3, pp. 10-17.

Mclaren, T.S., Head, M.M. and Yuan, Y.F. (2004), "Supply chain management information system capabilities: an exploratory study of electronics manufactures", *Information Systems and E-Business Management*, Vol. 2 No. 3, pp. 207-222.

المنارة للاستشارات

www.mana

Mohammad, Q.A., Haleem, A. and Mohammed, A. (2010), "Enablers and disablers to green supply chain in India", published and presented in the Proceeding of National Conference on Recent Development in Mechanical Engineering (NCRDME), Laxmi Devi Institute of Engineering and Technology, Alwar, October 29-30.

Mohammad, Q.A., Haleem, A. and Mohammed, A. (2011), "Identification of drivers for greening of supply chain in India", *International Journal of Construction Project Management*, Vol. 3 No. 3, pp. 1-17.

Mohammed, A., Egbu, C., Haleem, A., Ebohon, J. and Khalfan, M.M.A. (2009a), "State of green construction in India: drivers and challenges", *Journal of Engineering, Design and Technology*, Vol. 7 No. 2, pp. 223-234.

Mohammed, A., Egbu, C., Haleem, A., Ebohon, J. and Khalfan, M.M.A. (2009b), "Green construction in India: gaining a deeper understanding", *Journal of Architectural Engineering © ASCE*, Vol. 15 No. 1, pp. 10-13.

Molla, A. (2008), "GITAM: a model for the adoption of green IT", Paper No. 64, 19th Australasian Conference on Information Systems, December 3-5, Christchurch, pp. 658-668.

Motwani, J., Kumar, A. and Mohamed, Z. (1998), "Ethical behavior of Indian purchasing managers", *Transport Research, Part E*, Vol. 34 No. 2, pp. 667-677.

Mudgal, R.K., Shankar, R., Talib, P. and Raj, T. (2009), "Greening the supply chain practices: an Indian perspective of enablers' relationship", *International Journal of Advanced Operations Management*, Vol. 1 Nos 2/3, pp. 151-176.

Mudgal, R.K., Shankar, R., Talib, P. and Raj, T. (2010), "Modeling the barriers of green supply chain practices: an Indian perspective", *International Journal of Logistics Systems and Management*, Vol. 7 No. 1, pp. 81-107.

Nagel, M.H. (2000), *Environmental Supply Chain Versus Green Procurement in the Scope of a Business and Leadership Perspective*, International Symposium on Electronics and the Environment, San Francisco, CA, pp. 219-224.

Narasimhan, R. and Carter, J.R. (1998), "Environmental supply chain management", *Research Monograph*, The Center for Advanced Purchasing Studies, Arizona State University, Tempe, AZ, available at: www.capsresearch.org (accessed January 11, 2011).

Narasimhan, R. and Das, A. (2001), "The impact of purchasing integration and practices on manufacturing performance", *Journal of Operations Management*, Vol. 19 No. 5, pp. 593-609.

Ninlawan, C., Seksan, P., Tossapol, K. and Pilada, W. (2010), "The implementation of green supply chain management practices in electronics industry", *Proceedings of the International Multi Conference of Engineers and Computer Scientists Hongkong, March* 17-19, Vol. 3, pp. 1563-1568.

NRCC (2003), "National Research Council Canada. DfE and the Product Life Cycle", available at: http://dfe-sce.nrc-cnrc.gc.ca/overview/lifeCycle_e.html 20.1.2003 (accessed November 18, 2011).

Nukala, S. and Gupta, S.M. (2007), "A fuzzy mathematical programming approach for supplier selection in a closed-loop supply chain network", *Proceedings of the 2007 POMS-Dallas meeting*, pp. 4-7.

Nunes, B. and Bennett, D. (2010), "Green operations initiatives in the automotive industry-an environmental reports analysis and benchmarking study", *Benchmarking: An International*, Vol. 17 No. 3, pp. 396-420.

Olugu, E.U. and Wong, K.Y. (2009), "Supply chain performance evaluation: trends and challenges", *American Journal of Engineering and Applied Sciences*, Vol. 2 No. 1, pp. 202-211.

Olugu, E.U., Wong, K.Y. and Shaharoun, A.M. (2010), "A comprehensive approach in assessing the performance of an automobile closed loop supply chain", *Sustainability*, Vol. 2 No. 4, pp. 871-879.

المنارة للاستشارات

www.mana

Olugu, E.U., Wong, K.Y. and Shaharoun, A.M. (2011), "Development of key performance measures for the automobile green supply chain", *Resources, Conservation and Recycling*, Vol. 55 No. 3, pp. 567-578.

Ortiz, O., Castells, F. and Sonnemann, G. (2009), "Sustainability in the construction industry: a review of recent developments based on LCA", *Construction and Building Materials*, Vol. 23 No. 1, pp. 28-39.

Ozceylan, E. and Paksoy, T. (2013), "A mixed integer programming model for a closed-loop supply chain network", *International Journal of Production Research*, Vol. 51 No. 3, pp. 718-734.

Paksoy, T., Ozceylan, E. and Weber, G. (2009), "A multi objective model for optimization of a green supply chain network", A working paper, Department of Industrial Engineering, Selçuk University Campus, Konya, pp. 1-13 available at: www3.iam.metu.edu.tr/iam/images/d/dc/Preprint155.pdf (accessed February 6, 2011).

Paksoy, T., Bektas, T. and Ozceylan, E. (2011), "Operational and environmental performance measures in a multi-product closed-loop supply chain", *Transportation Research Part E*, Vol. 47 No. 4, pp. 532-546.

PaneHaden, S.S., Oyler, J.D. and Humphreys, J.H. (2009), "Historical, practical, and theoretical perspectives on green management", *Management Decision*, Vol. 47 No. 7, pp. 1041-1055.

Parmigiani, A., Klassen, R.D. and Russo, M.V. (2011), "Efficiency meets accountability: performance implications of supply chain configuration, control, and capabilities", *Journal of Operations Management*, Vol. 29 No. 6, pp. 212-223.

Penman, I. (1994), *Environmental Concern: Implications for Supply Chain Management*, Logistics and distribution planning: strategies for management, Kogan page, London.

Pujari, D., Wright, G. and Peattie, K. (2003), "Green and competitive influences on environmental new product development performance", *Journal of Business Research*, Vol. 56 No. 8, pp. 657-671.

Qingkui, C. and Junhu, R. (2009), "Study on the supplier evaluation in green supply chain based on rough sets theory and analytic hierarchy process", *International Conference on Electronic Commerce and Business Intelligence*, Vol. 3 No. 9, pp. 280-283.

Quan, C., Cheng, X., Wang, K. and Pan, P. (2008), "Research on green logistics and sustainable development", *International Conference on Information Management, Innovation Management and Industrial Engineering*, Vol. 8, pp. 162-165.

Ravi, V. and Shankar, R. (2005), "Analysis of interactions among the barriers of reverse logistics", *International Journal of Technological Forecasting and Social change*, Vol. 72 No. 9, pp. 1011-1029.

Rettab, B. and Ben Brik, A. (2008), "Green supply chain in Dubai. Dubai", available at: www.dubaichamber.com/wp-content/uploads/2009/07/GREEN-SUPPLY-CHAIN-IN-DUBAI.pdf/ (accessed April 12, 2012).

Roche, M. and Toyne, P. (2004), "Green lead – oxymoron or sustainable development for the lead acid battery industry?", *Journal of Power Sources*, Vol. 133 No. 1, pp. 3-7.

Rogers, D.S. and Ronald, S. (1998), *Tibben- Lembke, Going Backwards: REVERSE Logistics Trends and Practices*, Reverse Logistics Executive Council, Pittsburgh, PA, pp. 1-283.

Saaty, T.L. (2008), "Decision making with the Analytic Hierarchy Process", *International Journal of Sciences*, Vol. 1 No. 1, pp. 1-16.

Saaty, T.L. and Vargas, L.G. (2000), *Models, Methods, Concepts & Applications of the Analytic Hierarchy Process*, Springer, Norwell, MA.

Salam, M.A. (2008), "An empirical investigation of the determinants of adoption of green procurement for successful green supply chain management", *Proceedings of the 2008 IEEE ICMIT*, Vol. 9 No. 8, pp. 1038-1043.

المنارة للاستشارات

www.mana

Sarkar, A. and Mohapatra, P.K. (2006), "Evaluation of supplier capability and performance: a method for supply base reduction", *Journal of Purchase supply Management*, Vol. 12 No. 3, pp. 148-163.

Sarkis, J. (2003), "A strategic decision framework for green supply chain management", *Journal of Cleaner Production*, Vol. 11 No. 4, pp. 397-409.

Sarkis, J. (2009), "A boundaries and flows perspective of green supply chain management", Working Paper No. 7, GPMI Working Papers, Worcester, MA, October.

Sarkis, J., Hasan, M.A. and Shankar, R. (2007), "Evaluating environmentally conscious manufacturing barriers with Interpretive Structural Modeling", available at: http://ssrn.com/abstract = 956954; http://dx.doi.org/10.2139/ssrn.956954 (accessed September 13, 2013).

Sasikumar, P. and Kannan, G. (2009), "Issues in reverse supply chain, part III: classification and simple analysis", *International Journal of Sustainable Engineering*, Vol. 2 No. 1, pp. 2-27.

Seuring, S. (2004), "Industrial ecology, life cycles, supply chains: differences and interrelations", *Business Strategy and the Environment*, Vol. 13 No. 5, pp. 306-319.

Seuring, S. (2009), "The product-relationship-matrix as framework for strategic supply chain design based on operations theory", *International Journal of Production Economics*, Vol. 120 No. 1, pp. 221-232.

Seuring, S. and Muller, M. (2008), "Core issues in sustainable supply chain management – A Delphi study", *Business Strategy and the Environment*, Vol. 17 No. 8, pp. 455-466.

Shang, K.C., Lu, C.S. and Li, S. (2010), "Taxonomy of green supply chain management capability among electronics-related manufacturing firms in Taiwan", *Journal of Environmental Management*, Vol. 91 No. 5, pp. 1218-1226.

Shen, J. and Saijo, T. (2009), "Does an energy efficiency label alter consumers' purchasing decisions? A latent class approach based on a stated choice experiment in Shanghai", *Journal of Environmental Management*, Vol. 90 No. 11, pp. 3561-3573.

Sheu, J.B. (2008), "Green supply chain management, reverse logistics and nuclear power generation", *Transportation Research Part E*, Vol. 44 No. 1, pp. 19-46.

Sheu, J.B. (2011), "Bargaining framework for competitive green supply chains under governmental financial intervention", *Transportation Research Part E*, Vol. 47 No. 5, pp. 573-592.

Sheu, J.B., Chau, Y.H. and Hu, C.C. (2005), "An integrated logistics operational model for green-supply chain management", *Transportation Research Part E*, Vol. 41 No. 4, pp. 287-313.

Shukla, A.C., Deshmukh, S.G. and Kanda, A. (2009), "Environmentally responsive supply chains – learning from the Indian auto sector", *Journal of Advances in Management Research*, Vol. 6 No. 2, pp. 154-171.

Siddiqui, F., Haleem, A. and Wadhwa, S. (2009), "Role of supply chain management in context of total quality management and in flexible systems: a state-of the-art literature review", *Global Journal of Flexible Systems Management*, Vol. 10 No. 3, pp. 1-14.

Siddiqui, F., Haleem, A. and Sharma, C. (2012), "Strategic planning of service supply chain using dynamic SAP-LAP model: a case study of a leading gas organization in India", *International Journal of Services, Economics and Management*, Vol. 4 No. 3, pp. 169-185.

Simpson, D. and Samson, D.A. (2008), "Developing strategies for green supply chain management", *Decision Line*, Vol. 39 No. 4, pp. 12-15.

Singh, M.D. and Kant, R. (2008), "Knowledge management barriers: an interpretive structural modeling approach", *International Journal of Management Science and Engineering Management*, Vol. 3 No. 2, pp. 141-150.

المنارة للاستشارات

www.mana

Solvang, W.D., Deng, Z. and Solvang, B. (2007), "A closed-loop supply chain model for managing overall optimization of eco-efficiency", *POMS 18th Annual Conference Dallas, Dallas, TX, May 4-7*.

Srivastva, S. (2007), "Green supply chain management: a state of the art literature review", *International Journal of Management Review*, Vol. 9 No. 1, pp. 53-80.

Stevels, A. (2002), "Green supply chain management much more than questionnaires and ISO 14001", *Electronics and the Environment IEEE Conferences*, Vol. 2 pp. 96-100 ISSN: 0-7803-7214-X/02.

Sundarakani, B., DeSouza, R., Goh, M., Wagner, S.M. and Manikandan, S. (2010), "Modeling carbon footprints across the supply chain", *International Journal of Production Economics*, Vol. 128 No. 1, pp. 43-50.

Tan, J. and Zailani, S. (2009), "Green value chain in the context of sustainability development and sustainable competitive advantage: a conceptual framework", *International Journal of Business Insights & Transformation*, Vol. 3 No. 3, pp. 234-245.

Theyel, G. (2001), "Customer and supplier relations for environmental performance", *Greener Management International*, Vol. 35 No. 1, pp. 61-69.

Torielli, R.M., Abrahams, R.M., Smillie, R.W. and Voigt, R.C. (2011), "Using lean methodologies for economically and environmentally sustainable foundries", *China Foundry*, Vol. 8 No. 1, pp. 74-88.

Torres, B., Nones, S., Morques, S. and Evgenio, R. (2004), "A theoretical approach for green supply chain management", Federal University Do Rio Grande, Industrial Engineering Program, Natal-Brazil, available at: www.pomsmeetings.org/ConfProceedings/002/...CD/.../002-0290.pdf (accessed July 19, 2012).

Tseng, H.E., Chang, C.C. and Li, J.D. (2008), "Modular design to support green life-cycle engineering", *Expert Systems with Applications*, Vol. 34 No. 4, pp. 2524-2537.

Tuzkaya, G., Ozgen A., Ozgen, D. and Tuzkaya, U.R. (2009), "Environmental performance evaluation of suppliers: a hybrid fuzzy multi-criteria decision approach", *International Journal of Environ. Sci. Tech.*, Vol. 6 No. 3, pp. 477-490.

Udomleartprasert, P. (2004), "Roadmap to green supply chain electronics: design for manufacturing implementation and management", *International IEEE Conferences on Asian Green Electronics (AGEC)*, Vol. 4 No. 1, pp. 169-173.

Umeda, Y., Li, Y. and Tsukaguchi, H. (2003), "Reverse logistics system for recycling: efficient collection of electrical appliances", *Proceedings of the Eastern Asia Society for Transportation Studies*, Vol. 4 No. 1, pp. 1319-1334.

Vachon, S. and Klassen, R.D. (2006), "Green project partnership in the supply chain: the case of the package printing industry", *Journal of Cleaner Production*, Vol. 14 Nos 6/7, pp. 661-671.

Vachon, S. and Klassen, R.D. (2008), "Environmental management and manufacturing performance: the role of collaboration in the supply chain", *International Journal of Production Economics*, Vol. 111 No. 2, pp. 295-308.

Walker, H., Di Sisto, L. and Mc Brian, D. (2008), "Drivers and barriers to environmental supply chain management practices: lessons from the public and private sectors", *Journal of Purchasing and Supply Chain Management*, Vol. 4 No. 1, pp. 69-85.

Walton, S.V., Handfield, R.B. and Melnyk, S.A. (1998), "The green supply chain: integrating suppliers into environmental management processes", *International Journal of Purchasing and Materials Management*, Vol. 34 No. 2, pp. 2-11.

Wang, F., Lai, X. and Shi, N. (2011), "A multi-objective optimization for green supply chain network design", *Decision Support Systems*, Vol. 51 No. 2, pp. 262-269.

المنارة للاستشارات

www.mana

Wang, H.F. and Hsu, H.W. (2010), "Resolution of an uncertain closed-loop logistics model: an application to fuzzy linear programs with risk analysis", *Journal of Environmental Management*, Vol. 91 No. 11, pp. 2148-2162.

Woofi, G. and Zailani, S. (2010), "Green supply chain initiative: investigation on the barrier in the context of SME's in Malaysia", *International Business Management*, Vol. 4 No. 1, pp. 20-27.

Wu, G.C., Cheng, Y.H. and Hang, S.Y. (2010), "The study of knowledge transfer and green management performance in green supply chain management", *African Journal of Business Management*, Vol. 4 No. 1, pp. 44-48.

Wu, I.L. and Shen, Y.C. (2006), "A model for exploring the impact of purchasing strategies on user requirements determination of e-SRM", *Information & Management*, Vol. 43 No. 3, pp. 411-422.

Wu, Z. and Pagell, M. (2011), "Balancing priorities: decision-making in sustainable supply chain management", *Journal of Operations Management*, Vol. 29 No. 6, pp. 577-590.

Xiangru, M. and Zhang, J. (2008), "Research of evaluation model on enterprise's green degree of GrSCM", *International Seminar on Business and Information Management*, Vol. 9 No. 8, pp. 481-484.

Yang, C.L., Lin, S.P., Chan, Y.H. and Sheu, C.W. (2010), "Mediated effect of environmental management on manufacturing competitiveness: an empirical study", *International Journal of Production Economics*, Vol. 123 No. 1, pp. 210-220.

Yeh, W.C. and Chang, M.C. (2011), "Using multi-objective genetic algorithm for partner selection in green supply chain problems", *Expert Systems with Applications*, Vol. 38 No. 4, pp. 4244-4253.

Yu, B. and Hu, J. (2009), "An analysis on green supply chain management in e-commerce under the economic globalization", *International Conference on Business Intelligence and Financial Engineering*, Vol. 4 No. 9, pp. 595-599.

Yu, B., Sun, C. and Zhang, X. (2008), "The green supply chain management based on EMS", *Proceedings of International Conference on Automation and Logistics, Qingdao, September*, Vol. 7 No. 8, pp. 2199-2204.

Yu, L.C. (2007), "Adoption of green supply in Taiwan logistic industry", *Journal of Management Study*, Vol. 1 No. 1, pp. 90-98.

Yu, L.C. and Hui, H.Y. (2008), "An empirical study on logistics services provider, intention to adopt green innovations", *Journal of Technology, Management and Innovation*, Vol. 3 No. 1, pp. 17-26.

Yu, T.L. (2008), "Supply chain manager selection using a combined multiple intelligence theory and ANP approach", *WSFAS Transactions on Business and Economics*, Vol. 6 No. 5, pp. 351-360.

Zhao, C., Liu, W. and Wang, B. (2008), "Reverse logistics", *International Conference on Information Management, Innovation Management and Industrial Engineering*, Vol. 8 No. 1, pp. 349-353.

Zheng, F. (2010), "The evaluation of environmentally friendly condition of manufacturing supply chain", *3rd International Conference on Information Management, Innovation Management and Industrial Engineering*, Vol. 9 No. 10, pp. 116-121 ISSN: 978-0-7695-4279-9/10.

Zhu, Q. and Sarkis, J. (2004), "Relationships between operational practices and performance among early adopters of green supply chain management practices in Chinese manufacturing enterprises", *Operations Management*, Vol. 22 No. 3, pp. 265-289.

Zhu, Q. and Sarkis, J. (2006), "An inter sectoral comparison of green supply chain management in China: drivers and practices", *Journal of Cleaner Production*, Vol. 14 No. 5, pp. 472-486.

المنارة للاستشارات

www.mana

Zhu, Q. and Sarkis, J. (2007), "The moderating effects of institutional pressures on emergent green supply chain practices and performance", *International Journal of Production Research*, Vol. 45 Nos 18-19, pp. 4333-4355.

Zhu, Q., Sarkis, J. and Lai, K.H. (2007a), "Green supply management: pressures, practices and performance within the Chinese automobile industry", *Journal of Cleaner Production*, Vol. 15 Nos 11-12, pp. 1041-1052.

Zhu, Q., Sarkis, J. and Lai, K.H. (2007b), "Initiatives and outcomes of green supply chain management implementation by Chinese manufacturers", *Journal of Environmental Management*, Vol. 85 No. 1, pp. 179-189.

Zhu, Q., Sarkis, J. and Lai, K.H. (2008a), "Green supply chain management implications for "closing the loop"", *Transport Research Part E*, Vol. 44 No. 1, pp. 1-18.

Zhu, Q., Sarkis, J. and Lai, K.H. (2008b), "Confirmation of a measurement model for green supply chain management practices implementation", *International Journal of Production Economics*, Vol. 111 No. 2, pp. 261-273.

Zhu, Q., Geng, Y. and Lai, K.H. (2010a), "Circular economy practices among Chinese manufacturers varying in environmental-oriented supply chain cooperation and the performance implications", *Journal of Environmental Management*, Vol. 91 No. 6, pp. 1324-1331.

Zhu, Q., Geng, Y., Funjita, T. and Hashimoto, S. (2010b), "Green supply chain management in leading manufacturers-case studies in Japanese large companies", *Management Research Review*, Vol. 33 No. 4, pp. 380-392.

Zhu, Q., Sarkis, J. and Lai, K.H. (2011), "An institutional theoretic investigation on the links between internationalization of Chinese manufacturers and their environmental supply chain management", *Resources, Conservation and Recycling*, Vol. 55 No. 6, pp. 623-630.

Zhu, Q.H. and Dou, Y.J. (2007), "Evolutionary game model between governments and core enterprises in greening Supply Chains", *Systems Engineering – Theory & Practice*, Vol. 27 No. 12, pp. 85-89.

Zsidisin, G.A. and Siferd, S.P. (2001), "Environmental purchasing: a framework for theory development", *European Journal of Purchasing and Supply Management*, Vol. 7 No. 1, pp. 61-73.

Further reading

Klassen, R.D. and McLaughlin, C.P. (1996), "The impact of environmental management on firm performance", *Management Science*, Vol. 42 No. 8, pp. 1199-1214.

Lu, Q., Li, W., Sundarakani, B., Cai, S., De Souza, R. and Goh, M. (2008), "Green supply chain: How does it affect current supply chain practice", *Proceedings of the 2008 IEEE IEEM,* December 8-11, pp. 1128-1132, ISSN: 978-1-4244-2630-0/08.

Sarkis, J. (2006), *Greening the Supply Chain (Book Review)*, Springer, New York, NY.

Welford, R.J. (2000), *Corporate Environmental Management 3: Towards Sustainable Development*, Earthscan Publications Ltd., London, ISBN: 1-85383-641-9.

About the authors

Sunil Luthra is working as a Lecturer in the Government Polytechnic, Jhajjar. He is a Research Scholar (part-time) in the Mechanical Engineering Department at the National Institute of Technology, Kurukshetra, and Haryana, India. He has been associated with teaching for the last 12 years. He has contributed over 20 research papers in international referred and national journals, and conferences at international and national level. His specific areas of interest are operation management; optimization techniques; green supply chain management, etc. Sunil Luthra is the corresponding author and can be contacted at: sunilluthra1977@gmail.com

المنارة للاستشارات

www.mana

Dr Dixit Garg is working as a Professor in the Mechanical Engineering Department at the National Institute of Technology (Institute of National Importance as per Parliament act), Kurukshetra, Haryana, India. He published more than 100 research papers to his credit, published in international and national journals. He acted as an Editor/Reviewer in international journals/conferences and short-term training programmed. He delivered many expert lecturers and participated in panel discussions. He is presently acting as a Member, Board of Governors of Geeta Institute of Management and Technology, Kanipla (Kurukshetra); Dronacharya Institute of Management and Technology, Kurukshetra; Expert Member for various committees of AICTE New Delhi, UPSC New Delhi, Technical Education Department of Haryana Government, Kurukshetra University, Kurukshetra, etc. His specific areas of interest are operations and quality management, just-in-time (JIT), production planning and control, manufacturing processes, supply chain management, educational planning, industrial engineering, productivity, entrepreneurship and green supply chain management, etc.

Dr Abid Haleem is a Professor and Head of Mechanical Engineering and Coordinator of MBA (evening) program at the Faculty of Engineering and Technology, Jamia Millia Islamia (A Central University by an act of Parliament), New Delhi, India. He obtained his PhD from IIT Delhi in the area of "Policy Planning." He has more than 110 research papers to his credit, published in international and national journals. He has extensive experience in coordinating different types of academic and associated programs in the field of management and technology. Has edited a book titled "*Innovation, Flexibility and Technology Transfer*," published by Tata McGraw Hill, India. His research interests are e-governance, technology management, green supply chain management and systems modeling, flexibility, etc. He is an Editor Asia Pacific of Global Journal of Flexible Systems Management. He is also Editorial Board of Contemporary Management Research.

To purchase reprints of this article please e-mail: **reprints@emeraldinsight.com**
Or visit our web site for further details: **www.emeraldinsight.com/reprints**

المنارة للاستشارات

www.mana

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.

www.manaraa.com