

GREEN SUPPLY CHAIN MANAGEMENT PRACTICES AND OPERATIONAL PERFORMANCE IN AUSTRALIAN COMPANIES

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Abstract

Green supply chain management has emerged as a key approach for enterprises aiming to **become** environmentally sustainable. The study will investigate the kinds of environmental management practices that are undertaken by Australian companies in greening the supply chain and how these practices affect the environmental and operational performance of these companies. The study provides additional insight into the growing field of literature examining the relationships between environmental policies and operational performance. This paper is the first of a two-part research paper in the area of green supply chain management.

Keywords: management, supply chain, environment, performance, practice

INTRODUCTION

Environmentally conscious business practices have been receiving increasing attention from both researchers and practitioners. The number of organisations contemplating the integration of environmental practices into their strategic plans and operations is continuously increasing (Sarkis, 2003). Numerous initiatives have provided incentives for organisations to become more environmentally friendly. The concepts pertaining to supply chain environmental management (SCEM) or greening the supply chain are usually understood by industry as screening suppliers for environmental performance and then doing business with only those that meet regulatory standards (Rao, 2002). The driving forces for introducing and implementing the concept into the company operations are numerous and comprise a range of “reactive regulatory reasons to proactive strategies and competitive advantage reasons” (Sarkis, 1999). Approaches such as cleaner production, environmental management systems and eco-efficiency have been implemented for green management practices. The factors driving the competitive advantage through environmental performance have been identified as market expectations, risk management, regulatory compliance and business efficiency (Zhu and Sarkis, 2005). Green supply chain management (GSCM) has a key role in ensuring that all of these factors are addressed (Hutchison, 1998). Environmental impact occurs at all stages of a product’s life cycle. Therefore GSCM has emerged as an important new archetype for enterprises to achieve profit and market share objective by lowering the environmental

risks and impacts and while raising their ecological efficiency (van Hock and Erasmus, 2000). In this project the terms SCEM and GSCM will be used interchangeably.

LITERATURE REVIEW

The concept of supply chain management has been observed as a recent and novel tool and the literature in green supply chain management has been growing in recent years. Min and Galle (1997) conducted an empirical survey of US purchasing managers with regard to green purchasing and have found that the primary driving force to green purchasing is an urge to meeting regulations rather than environmental monitoring or partnerships. The effectiveness of green purchasing also depends on whether the firm has centralised or decentralised decision making (Birell, 1998), which determines the extent of flexibility in the green purchasing process. In a survey, purchasing managers listed the impact of environmental regulations on purchasing activities as their second most important future concern (Monczka and Trent, 1995).

The relationship between GSCM and organisational performance has been investigated (Green et al., 1998) but the results have not been conclusive. There exist two contrasting views about the relationship between environmental practices and organisational performance. The first viewpoint argues that many managers believe that environmental management consists simply of compliance with regulations, and that a trade-off exists where increased level of environmental management results in increased cost (Walley and Whitehead, 1994). This relationship might exist in part due to increased costs associated with the transference of externalities, such as the cost of polluted air, back to the firm (Klassen and McLaughlin, 1996). Barbara and McConnell (1990) studied the effect of abatement capital on industry productivity and found that abatement capital was responsible for a decline in productivity. Gallop and Roberts (1983) studied the effects of environmental regulations on the cost of operations in the electricity utilities industry and found a similar effect - environmental regulations were associated with a decline in industry productivity.

There is also a body of research that suggests a positive relationship between environmental practices and organisational performance. Klassen and Mclaughlin's (1996) proposed model and empirical findings suggests a positive effect of environmental performance through both market and cost pathways. Recent literature has provided insight on the potential pattern of supply chain practices for improving environmental performance (Florida, 1996, Handfield et al., 2002, Florida and Davison, 2001). The literature for supporting this positive relationship is relatively strong (Zhu et al., 2005). Frosch (1994) argued that an inter-firm linkage facilitated by proximity could lead to an improvement in environmental performance. Geffen and Rothenberg (2000) suggested that relations with suppliers aid the adoption and development of innovative environmental technologies. Furthermore, the interaction of customer and supplier staff, partnership agreements and joint R & D leads to improved environmental performance. It is not very clear whether GSCM practices relate to positive or negative economic performance (Wagner, et al, 2001). Alvarez et al. (2001) indicated that environmental management such as GSCM has a positive relationship with an organisation's economic performance. According to Klassen and Mclaughlin (1996), organisations that minimise the negative environmental impacts of their products and processes, recycle post-consumer waste and establish environmental management systems are poised to expand their markets or displace competitors that fail to promote strong environmental performance. However, Bowen et al. (2001) suggested economic performance is not being reaped in short-term profitability or sales performance. Szwilski (2000) indicated that an environmental management system is an innovative environmental policy and information management tool for industry to improve organisational performance. Tooru (2001) demonstrated, using a case study, that an environmental management system can improve operational performance of a firm. Hanna et al. (2000) observed a strong relationship between the meeting of goals and staff involvement on environmental management.

Revenues can be positively impacted when customers prefer the products of environmentally friendly firms (Winsemius and Guntram, 1992), resulting in increased market share vis-a-vis less environmentally oriented competitors. Costs can be lowered when firms invest in environmental management systems that result in a decrease in accidental environmental releases and liability. Costs

may be reduced through proactively managing environmental regulations, which may create barriers and first-mover advantages that are difficult for competitors to imitate (Dean and Brown, 1995; Porter and van der Linde, 1995). Orlitzky et al. (2003) showed, based on a meta-analysis integrating 30 years of research, that there is a positive association between corporate social performance and corporate financial performance across industries.

There is a dearth of empirical research concerning GSCM practices and organisational performance and it is important to investigate the effect of green supply chain management practices on environmental and operational performance of Australian organisations.

The aims of the study (research questions) are the following:

1. What kind of environmental management practices are undertaken by Australian companies in order to improve their environmental performance?
2. How does the practice of green supply chain management practices affect the environmental and operational performance of Australian companies?

SIGNIFICANCE OF RESEARCH

Green supply chain management has emerged as a key approach for enterprises aiming to become environmentally sustainable. With increased pressures for environmental sustainability, it is expected that enterprises will need to implement strategies to reduce the environmental impacts of their products and services. Success in addressing environmental items may provide new opportunities for competition, and new ways to add value to core business programs. Enterprises have increased their environmental awareness due to regulatory, competitive and marketing pressure and driver. The proposed study will investigate the kinds of environmental management practices that are undertaken by Australian companies in greening the supply chain and how these practices affect the environmental and operational performance of these companies. The authors are unaware of any existing study that has been undertaken in this relatively new area of environmental supply chain management in Australia. The study is significant as it will provide guidelines to companies regarding

the appropriate type of environmental management practices in order to improve their environmental and operational performance.

The study will provide additional insight into the growing field of literature examining the relationships between environmental policies and operational performance. The anticipated outcomes, which will include the development of a reliable and validated measurement instrument to measure SCEM practices and the impact of adoption of environmental practices on operational performance of the organisations, will advance the knowledge base of the discipline. The proposed aims and concepts are innovative because the research framework and aims have been developed after an extensive review of the literature along with consultations with academicians and practitioners. The interdisciplinary nature of the work in this area means that this study will benefit from theory development from various fields to advance the extant body of knowledge.

This study will explore the supply chain environmental management practices of Australian companies and their effect on environmental and operational performance, thus assisting organisations to implement environmental practices not only to comply with government regulations but also to become more competitive by improving operational performance.

DEVELOPMENT OF FRAMEWORK

A research framework will be developed to investigate the relationships between four GSCM practices that companies may implement to improve their performance. GSCM practice dimensions and items are based on previous literature that addressed various aspects of GSCM (Zsidisin and Hendrick, 1998; Walton et al., 1998; Zsidisin and Siferd, 2001; Rao, 2002, Zhu and Sarkis, 2004). Performance items were developed after a thorough review of the literature and consultation with academic and professional experts. The elements of the four GSCM practices of the framework are shown in Table 1. Performance elements are shown in Table 2.

Table 1

GSCM Practices Construct

Environmental management practices within the organisation.

Commitment of GSCM from senior and middle level managers
Total quality environmental management
Environmental compliance and auditing program
ISO 14000 certification

GSCM practices relating to suppliers and customers

Providing design specification to suppliers that includes environmental requirement for purchased items
Cooperation with suppliers for environmental objectives
Supplier's ISO 14000 certification
Company-wide environmental audits
Environmental management for supplier's internal management
Provide training to build supplier environmental management capacity
Cooperation with customer for eco-design and cleaner production
Cooperation with customers for green packaging

Environmental conscious product and process design

Environmentally friendly raw material
Design of products for reduced consumption of material and energy
Design of products for reuse, recycle, recovery of material, component parts
Design of products to avoid or reduce use of hazardous of products and/or their manufacturing process
Optimisation of process to reduce solid/liquid waste
Optimisation of process to reduce air emission and noise
Use reverse logistics

Investment recovery

Investment recovery of excess inventory/materials
Sale of scrap and used materials
Sale of excess capital equipment

Table 2

Environmental and operational performance constructs:

Environmental performance

Reduction of solid/liquid waste

Reduction of emissions
Improvement of environmental compliance
Reduction of consumption for hazardous/toxic materials
Reduction of frequency of environmental accidents
Reduction of electricity usage

Operational performance

Cost savings and increased efficiency
Product quality improvement
Reduced lead times
Increase in market share
New market opportunities
Enhance employee motivation and performance
Increase in sales

A description of the GSCM practices and performance constructs is given below:

There is agreement within the literature that environmental management practices in the organisation are a key to improve enterprise performance (Cater et al., 1998). It is well known that senior manager's support is necessary, and often a key driver for successful adoption and implementation of most innovations, technology, programs and activities (Hamel and Prahalad, 1989). Carter et al. (1998) concluded that support from mid-level managers is also key to successful implementation of GSCM practices. Bowen et al. (2001) used middle managers to find positive relationships between middle managers' perceptions of corporate environmental pro-activity and environmental management.

GSCM practices relating to suppliers and customers are concerned with the 'inbound' and 'outbound' aspects of supply chain management. From the 'inbound' perspective of the supply chain it is argued that greening the supply chain has numerous benefits for an organization, ranging from cost reduction, to integrating suppliers in a participative decision making process that promotes environmental innovation (Bowen et al., 2001, Rao, 2002). A large part of the inbound function essentially

comprises of green purchasing strategies adopted by organisations in response to increasing global concerns of environmental sustainability (Min and Galle, 1997). Walton et al (1998) examine the integration of suppliers into environmental management processes, and observe two evolving trends. They firstly suggest that environmental issues are becoming an intrinsic part of strategic planning in organisations due to stricter regulations and the demands of environmental accountability. They also observe a second trend amongst their case examples, that organisations are integrating their supply chains to reduce operating costs and improve their customer service. Green purchasing strategies arguably resolve around two key components, the evaluation of suppliers' environmental performance and mentoring to assist suppliers to improve their performance. Noci (2000) has detailed the range of tools and techniques in place to assess the environmental behaviour of suppliers to aid in supplier selection. Often organisations urge suppliers to develop their own in-house environmental management system, and many request that a supplier accredits to an environmental management standard such as ISO 14001 (Rao and Holt, 2005). Hines and Jones (2001) identify the mentoring role within green supply chain management as an emerging concept that promotes a more significant relationships between the customer and the supplier.

On the outbound side of green supply chain, green marketing, green packaging and environmental friendly distribution are all initiatives that might improve the environmental performance of the supply chain (Rao, 2002, Sarkis, 1999). Packaging performs a number of functions including containment, protection, preservation, apportionment, unitisation and presentation (Zsidisin and Sifred, 2001). In order to address the environmental impact of packaging, many countries now have programs that aim to minimise the amount of packaging that enters the waste stream. The reuse of packaging can be found in reusable, collapsible shipping containers (Kroon and Vrigens, 1995). Green marketing has an important part to play in the link between environmental innovation and competitive advantage (Menon and Menon, 1997). Encouraging suppliers to take back packaging is a form of reverse logistics that can be an important consideration in greening the outbound function. Wu and Dunn (1995) argued that standardised reusable containers, good merchandising layouts, and

easy information access reduce storage and retrieval delays which leads to cost saving whilst being environmentally friendly.

Environmentally conscious product and process design may purposely incorporate a number of concepts such as environmentally friendly raw material, design for reduced consumption of material and energy, use of cleaner technology processes to reduce solid and liquid waste and use of reverse logistics. Investment recovery is an emerging environmental practice and many enterprises have considered investment recovery as a critical aspect for GSCM (Zsidisin and Hendrick, 1998).

METHODOLOGY

The methodology involved in the project will comprise both survey research and case research. A survey instrument will be used to facilitate data collection for the study. The survey based approach will allow the researchers to collect data pertaining to the attitudes of the respondents towards GSCM practices and the environmental and operational performance of the companies. The survey questions will use a seven-point Likert scale (1=none, 7= extensive). Survey questions will be pre-tested for their content validity by a panel of industry managers and academicians. The prospective sample will be drawn from a list of ISO14001 certified companies in Australia and also from Dunn and Bradstreet Business Directory. A mailing list of about 5000 companies will be prepared. Surveys will be sent to supply chain professionals representing the organisations in manufacturing and service sectors in Australia. Factor analysis will be conducted to further confirm groupings of GSCM practices and performance from the survey data. Several statistical methods and tests will be used to empirically group the scale items of GSCM practices. Similar factor analysis will be conducted on the GSCM performance items to group scale items. Reliability tests for these factors will be carried out by determining Cronbach's alpha values for each group. The analysis will use a cut-off point of 0.7 or more to ensure reliability of the measures. The constructs of GSCM practices and environmental and operational performances will be used to answer the research questions using multivariate data analysis (such as bivariate correlation, regression analysis and Structural Equation Modelling).

The aim of using case research through field studies is to enhance the quantitative findings obtained from the large-scale survey. Using qualitative case studies (in addition to a quantitative survey) serves the purposes of data triangulation, the use and combination of different methods to study the same phenomenon. Such methods can include interviews, questionnaires, direct observation, content analysis of documents and archival research (Voss et al., 2002). A number of potential organisations for field study will be identified and contact will be established with the key informants. Interviews will be conducted with the key informants to collect relevant information. Interviews will be tape recorded, transcripts prepared and 'case study notes' will be written. In addition relevant company documents will be examined in relation to GSCM issues and plant visits will be conducted wherever possible to gather additional insight.

CONCLUSION

The research is expected to examine the relationship between GSCM practices and operational and environmental performance in Australian companies. A general framework is developed and a reliable and validated measurement instrument to measure GSCM practices will be developed. In particular, the study will examine whether adoption of environmental practices in supply chain management results in a positive operational performance of the companies. The study will also reveal how various components of GSCM practices impact on environmental performance as well as operational performance of companies.

The research will be of great benefit as it is expected to provide valuable insight into the growing field of environmental supply chain management and will make a substantial contribution to 'sustainability'. In particular, the project is expected to provide guidance to Australian organisations in regard to the implementation of environmental supply chain management practices and to increase their international competitiveness that will result in economic benefit to Australia. In the last few years, there has been significant concern about reduction of greenhouse gas emissions and preservation of the natural environment for future generation. The project, whose whole purpose is the investigation of the environmental aspects of supply chain management will go a long way in

addressing this concern. The project will result in social benefits as it will have substantial impact in increasing community awareness of preserving and protecting the environment.

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