



Why and how to adopt green management into business organizations?

Korean SMEs in manufacturing industry

The case study of Korean SMEs in manufacturing industry

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Abstract

Purpose – The purpose of this paper is to explore and investigate the process of green management adoption in small and medium-sized enterprises.

Design/methodology/approach – The study used the qualitative methods of case study, in-depth interviews and document analysis to collect data from two companies, one in the acoustic equipment, the other in the electronics industry.

Findings – The paper finds that the extant literature in the field of business and management has largely ignored green management practices within small and medium-sized enterprises (SMEs). The study finds that SMEs can make themselves greener by making strategic and organizational changes. For greener management, the factors of organizational structure, innovation capability, human resources, cost savings and competitive advantage can influence organizational change. The outcomes of the case studies confirmed this. The paper argues that further research is needed in order to identify how management practice might reduce negative sustainability impacts. The paper argues that such research can benefit from the methodological and theoretical insights of other disciplines.

Originality/value – The paper is of benefit to academics and managers by providing a new way to consider green management and strategies of SMEs. Since green sustainability is obviously challenging to all companies, to increase understanding of how to cope with green management is necessary, but has been rarely researched in SMEs.

Keywords Environmental management, Manufacturing industry, Small to medium-sized enterprises, South Korea

Paper type Research paper

Introduction

Since the publication of the report *Our Common Future* in 1987 by the World Commission on Economic Development (WCED, 1987), the term sustainable development has seen wide use, and is generally defined as a practice “to meet the needs of the present without compromising the ability of future generations to meet their own needs” (WCED, 1987, p. 43). The WCED asserted the simultaneous adoption of environmental, economic, and social principles to pursue sustainable development. However, this has met with skepticism as it challenges the assumption that environmental and social integration are at odds with economic prosperity. This discord is even more apparent between business academics and practice. For example, it has been argued that there is an intrinsic conflict between environmental protection and business performance. This line of argument posits that growing demands for



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corporations to protect the environment will increase the cost burden, and as a result companies will have less resources to increase productivity and may lose their competitiveness in the market (Palmer *et al.*, 1995).

The concept of corporate sustainability increasingly impacts the nature of firms' operations. Whereas sound economic performance in the past was expected to guarantee corporate success by companies and its shareholders, increasingly business now is led by the so-called triple bottom line. Economic and financial results need to be accompanied by the minimization of ecological footprints and increased attention to social aspects. Therefore, the strategic issue, corporate environmentalism or green management emerged in 1990s and became popular slogan internationally in 2000s. The concept, defined as the process by which companies manage environmental or green issues and develop environmental management strategies, becomes strategically dominant issue for large companies, especially multinational enterprises operating their business globally (Banerjee, 2001). In the field of business and environment literature, green management refers to the management of corporate interaction with, and impact upon, the environment (Lee and Ball, 2003). Green management in organizations has to go beyond regulatory compliance and needs to include conceptual tools such as pollution prevention, product stewardship and corporate social responsibility (Hart, 2005).

Palmer *et al.* (1995), in line with conventional neoclassical economics, uphold that stringent environmental regulations leave the polluting firm worse off. They argue that while firms may invest in and adopt a new more efficient abatement environmental technology, if the technology was not worth investing in previously, the benefits will not be enough to compensate the companies.

Porter and van der Linde (1995, 1996) have countered the conventional neoclassical model; they argue that sweeping inefficiencies out of the production process or fostering innovation to meet strict environmental regulations may bring early-mover advantages for companies. Consequently, it is argued that improved business performance will be gained while technological and market leadership may also be enjoyed (Porter, 1991; Porter and van der Linde, 1996).

More recently, Berry and Rondinelli (1998) reported that many multinational companies have accepted the argument that the three principles of sustainability, i.e. economic prosperity, environmental integrity, and social equity, are consistent internally. Over time, corporate attitudes to sustainability have changed considerably from a reactive to a proactive stance.

In 2008, a McKinsey survey reported that more than 80 percent of 2,192 executives anticipated the emergence of some kind of environmental issue, in particular climate change regulations, within the next five years in countries where their companies operate. The most active businesses intend to try to build these regulations and may even push for tougher regulations that would disadvantage their less environmentally savvy competitors. A total of 81 percent of executives say that states and businesses should play a role in tackling climate change, as this is considered the societal trend most likely to affect shareholder value over the next five years, as well as other environmental and social issues (*The McKinsey Quarterly*, 2008). The key question for executives at corporations regarding corporate greening or green management is "how to integrate environmental decision making into business with profitable results."

However, studies of green management in relation to small and medium-sized enterprises (SMEs) are very scarce in business and management literature. In organizational management studies, Gladwin *et al.* (1995) ask researchers to take environmental issues into account for developing organizational studies. In strategic management, Noci and Verganti (1999) observed that the mainstream literature is concerned about the analysis of large companies and rejects analysis of the SMEs' peculiarities. As Hitchens *et al.* (2004) point out, the problem is acute among SMEs because they are additionally handicapped by lack of information and resources to invest in green management. Thus, it is important to understand why and how SMEs adopt green management into business organizations.

This paper explores corporate environmentalism as a strategic consideration of the environmental issues in SMEs. In particular, the two in-depth case studies of SMEs in Korean manufacturing industry are provided. Exploring corporate environmentalism in SMEs begins with a literature review of strategic management and sustainability. The two case studies follow, addressing the factors that lead to the adoption of green management in strategic organizational change, and highlighting comparative findings in green management.

Corporate green sustainability and sustainable enterprise in business and management

In his book *The Hidden Connections*, Capra (2002) gives a warning to corporate society by stating "firms are missing many new sustainable business opportunities that may prevent the threat of an inevitable collapse of society by ignoring the hidden connection between business and the environment and society". As more companies recognize sustainability as an important strategic issue, developing strategic plans becomes another significant mission for companies to retain their competitiveness.

Corporate executives and decision makers face difficult choices with regard to sustainability. Is it possible to sustain economic growth and avoid major disruptions or environmental and/or social impacts? Over the last two decades, awareness of corporate green sustainability has increased significantly in many business organizations and enterprises. Green sustainability and corporate responsibility have become increasingly important strategic issues for companies in most industries. Leading manufacturers in Europe, the USA, and Asia have begun to emphasize "green" and "sustainability" in their internal business processes, to external stakeholders, and in investor relations. For example, Toyota has adopted green sustainability principles in its production strategies by developing profitable approaches for meeting consumer energy needs. The Prius, a Toyota-made hybrid car, is an environmentally friendly car that has captured a major portion of its market. The driver can determine how much and what form of energy the car is using at any given time and the vehicle's energy efficiency is relayed on the dashboard, thereby broadcasting its environmental benefits. In 2006, the Prius occupied 76 percent of the US hybrid car market (Bonni and Oppenheim, 2008).

However, since the term sustainability was coined in the *Brundtland Report* in 1987, corporate responses have varied substantially. Hart (2005) described this corporate sustainability response as a "buzzwords associated concept". He listed the corporate responses for sustainability in short-term and long-term views (see Table I).

Table I.
The listed buzzwords for corporate sustainability

Short-term/internal	Long-term/external
Environmental management systems	Sustainable development
Pollution prevention	Base of the pyramid
Eco-efficiency	Corporate social responsibility
Risk management	Stakeholder management
Environmental management	Industrial ecology
Clean technology	Design for environment
Eco-effectiveness	Life cycle management
Cradle to cradle	Full cost accounting
Closed loops	Transparency
	Corporate governance

Source: Adapted from Hart (2005, p. 22)

More importantly, Hart (2005) pointed out that innovation and repositioning to achieve sustainability are critical undertakings that will also increase shareholder value. In order to make companies sustainable, it is important to consider how efficiently firms operate their current assets, and, at the same time, how well they reposition and acquire new capabilities for the future by pursuing short-term and long-term sustainability creating activities. Hart (2005) and Hart and Milstein (2003) presented a strategy framework that described how firms can invest through the lens of sustainable enterprise while increasing shareholder value (i.e. profitability) boosted by increasing corporate green sustainability (see Figure 1).

Applying the corporate green sustainability strategy matrix may offer numerous benefits, such as cost savings resulting from eco-efficiency, enhanced corporate image, improved relationships with local communities, access to new green markets and superior competitive advantage, among others (Shrivastava, 1995). However, some scholars argue that these benefits are relevant to larger companies only, not to SMEs (Noci and Verganti, 1999; Alberti *et al.*, 2000).

	Present	Future
Internal	<p>Approach: Pollution Prevention Minimize waste and emissions from operations</p> <p>Payoff: Cost & Risk Reduction</p>	<p>Approach: Clean Technology Develop the sustainable competences and disruptive innovation</p> <p>Payoff: Innovation & Repositioning</p>
External	<p>Approach: Product Stewardship Increase accountability and transparency</p> <p>Payoff: Reputation & Legitimacy</p>	<p>Approach: Sustainability Vision Create a shared roadmap for meeting unmet needs</p> <p>Payoff: Growth Trajectory</p>

Figure 1.
Corporate green sustainability strategy matrix

Source: Adapted from Hart (2005, p.23)

The sustainability strategy framework in Figure 1 illustrates that returns on investments in sustainability can produce present and future value within the internal operations in a firm and externally in the broader market. Whereas larger firms seek ways to increase profits through innovations within an existing sustainability boundary, the appreciation in value for multinational enterprises with their own brand is largely achieved through maximizing opportunities found in incremental improvement in existing operations through pollution prevention and finding sustainable efficiencies (see Figure 1).

By integrating sustainability into business strategies, firms try to seek greater profitability through adoption of deliberate sustainable strategies. Sustainable strategies such as pollution prevention and product stewardship create synergistic effects for suppliers and business partners working collaboratively (Hart, 2005; Moore and Manring, 2009; Lee and Kim, 2009).

As corporate sustainability becomes more commonplace, there is an associated need to identify and understand “the business cases” for sustainability (Schaltegger and Wagner, 2006). It is important to identify, measure, and understand how firms change through a process of adopting and implementing sustainability internally and externally.

SMEs and green management

Where larger firms, often multinational enterprises, have been developing the capabilities needed to achieve the triple bottom line over the last decades, small and medium-sized enterprises (SMEs) often lack the knowledge, expertise, skills, finance and human resources to make the desired changes within organizations (Lee, 2008). In addition, it is often observed that the approaches are narrowly focused to specific features of the production process or the product when the SMEs attempted to change. Thus, SMEs often have a limited view on the direction of future innovation and tend to tackle green issues in an *ad hoc* manner (Lee, 2008; Nawrocka, 2008).

With a small sample of Italian industries, Azzone *et al.* (1997) find the peculiarities of the small firms' resources. These include lack of financial resources to assign to green initiatives, the ability of adapting its own organization from external stimuli, and the absence of an organizational unit specially aimed at managing environmental issues. In a similar vein, with a large sample of Korean industries, Lee (2007, 2008) identifies a current movement of SMEs in green management: SMEs are shifting from a command and control approach to a market and competition approach in implementing green management.

Following the EU parliament's approval of the European Union (EU) directives on Waste Electrical and Electronic Equipment (WEEE), Restriction of Hazardous Substances (RoHS), and Eco-design for Energy using products (EuP), a leading group of companies in the electronics and consumer products industry, including Samsung, LG, Sony, Toshiba, NEC, IBM, HP, and Dell, have adopted “green” standards in their supply chain management. Final manufacturers often exercise buying power to pressure their suppliers to achieve superior environmental performance. As part of the RoHS-compliance program, many larger companies are asking their suppliers to verify parts and components compliance to secure compliance of the final products (Cusack and Perrett, 2006). Many of the suppliers over the supply chain are SMEs. At least 80 percent of all global enterprises are considered SMEs, having less than 250 employees

(Moore and Manring, 2009). SMEs constitute at least 85 percent of US business; 99 percent of the business in the European Union, over 99 percent of enterprises in Korea. According to OECD (1985, 1995), the manufacturing sectors considered are those dominated by SMEs where product and process environmental response by the firm is important in Europe and Asia.

If we consider over 80 percent of all global enterprises are SMEs, then there is a growing concern to create a business case for sustainability of SMEs, to promote SME investments in sustainable business practices. Taking into account the stricter environmental requirements at present and in future, it is necessary to scrutinize the SMEs' characteristics in their business operation to face the green or environmental management problems and sustainability issues, as well as to suggest useful mechanisms for such. In order to understand the specific circumstances of how to utilize green management at SMEs, the strategic contexts of organizational structure, innovation capability and human resources for green management are considered for further clarification.

Organizational structure

For large companies, the strategic issue of green management became fashionable. However, SMEs in general have encountered difficulties in implementing environmental management actions due to less formally standardized and structured organizations (Alberti *et al.*, 2000; Brío and Junquera, 2003). However, it should be noted that the adoption of green management actions and practices may result in loss of SMEs' flexibility. According to Noci and Verganti (1999), SMEs' managers consider that it is easier to face the environmental challenge by means of reactive and implicit actions.

Innovation capability

Adopting green management into daily business operations demands more innovative approach to develop technological and organizational capabilities. In addition, green management activities require a large amount of resources of a diverse nature. SMEs have difficulties in obtaining financial and technological resources with the purpose of tackling their business activity. Although Azzone *et al.* (1997) argue that it is difficult to introduce and obtain benefits from pollution prevention technologies for SMEs, Noci and Verganti (1999) suggest that SMEs with high innovation capacity enable the successful development of very advanced green management practices and activities.

Human resources

According to Callenbach *et al.* (1993), in order to carry out green management, employees must be inspired, empowered and environmentally aware for greening to be successful. Corporate green management requires a high level of technical and management skills in employees, since the company will develop innovation-focused environmental initiatives and programmes that have significant managerial implications. In this respect, the introduction of training programmes aimed at increasing the employees' environmental awareness and courses specifically addressed to the development of new technical and management competencies has a basic importance for fostering environmental innovations (Hart, 2005; Perez-Sanchez *et al.*, 2003).

Cost savings and competitive advantage

Green management can be a source of cost savings and competitive advantage for SMEs. By improving environmental performance and product differentiation, cost leadership as well as differentiation can be operationalized in environmental practice (Porter, 1985; Shrivastava, 1995). Christmann (2000) points out the potential benefits of specific green management practices in achieving low cost and differentiation advantages. From the framework of Hart (2005), a firm's level of innovation in proprietary pollution prevention technologies affects the advantage it gains from green management.

Case study: two sample cases

Owing to the wide set of framework and theoretical approaches that should often be considered in green management, the implementation of conceptual models may be complex. In many cases, most conceptual models or theories of sustainability and/or environmental management are not applicable to SMEs. For instance, Graham and Bertels (2008) found that the existing sustainability portfolio framework and tools proved unsuccessful in their application.

According to Lee (2008), Korea is predominantly a nation of SMEs, with 99.2 percent of all manufacturing companies, accounting for 70.5 percent of the total 2.32 million employees in the manufacturing sector. Increasing environmental regulatory pressures internationally have been driving firms, both large and small, and government to proactively move towards green management. In 2003, the Korean government launched a new green management policy aimed at expanding environmental management throughout the entire supply chain, in particular, SME suppliers. The government has encouraged SMEs to improve their environmental performance, utilizing manufacturer-supplier relationships. The choice of context is grounded in the industry's international orientation and exposure to the issues of green management. In addition, a certain level of industry representativeness in a chosen sector was considered for this study, for example, market share, sales volume, business operation periods, and international expertise. The choice of methodology is supported by our access to rich and comprehensive empirical sources.

Two case studies, which were conducted between March 2008 and September 2008, are analyzed in this research. The primary form of data collection was a series of interviews with the senior management and line management. The focus of the interviews included:

- why (why don't) the company adopts green management practices;
- to what extent the company encourages staff and employees to incorporate green management in their operations; and
- what driving forces motivate the incorporating of green management activities in the company.

In addition to the interviews, frequent site visits and documents research (industry statistics, annual reports, media, industry association data, government environmental regulation reports) to examine and cross-checking qualitative data are conducted to increase research validity (Yin, 2002). In the following section, the cases of a Korean company in the acoustic equipment industry and a Korean company in the electronics industry are analyzed.

Case study A. The Korea Omyang

(1) General background

The company, Korea Omyang was established as a 50-to-50 joint venture with ONKYO of Japan in 1996, but is totally independent at present. Total number of employees is 197 and sales volume is about 200 billion Korean won. The main products of the Korea Omyang include speakers and audio systems in automobiles. The domestic acoustic equipment industry has been growing rapidly since its inception, but experienced a decline since 2005 (see Figure 2).

In the industry, the main customers for the Korea Omyang include Hyundai Motors, GM Daewoo Motors, GM, Toshiba, Sharp and Sony. In particular, the Korea Omyang is responsible for 48 percent of Hyundai Motors' speaker consumption and supplies a significant proportion to other manufacturing companies in the Automobile and Electronics industry.

(2) Green challenges in production process

One of the main processes in producing speakers is the production of cone paper and assembly. Figure 3 shows the cone paper manufacturing process, which generates significant amounts of wastewater. All wastewater generated comes from the pulp beating and paper making processes and effluent from the wastewater treatment plant. Parts of the effluent is recycled and reused in the process while others are discharged (see Figure 3).

The production process requires a large amount of glue, which is hazardous to the environment. The glue is highly dangerous material to the people and the natural environment because toxic vapors given off while it dries, and is also a source of solid waste.

Currently the water demand for production is 1,830m³/month of municipal water and 3,964m³/month of recycled water. A total of 62,689 kilograms of hazardous materials are used annually generating 34.97m³ of wastes. The Korea Omyang faces

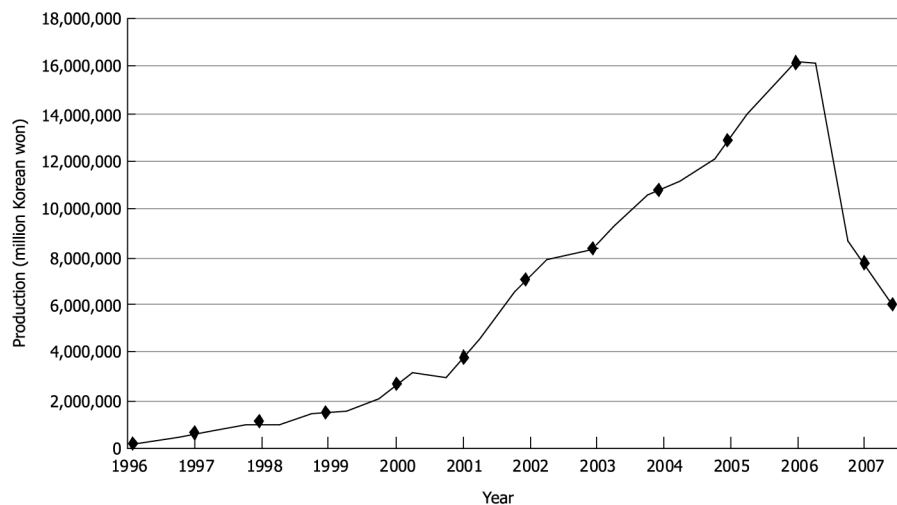


Figure 2.
The general trend of
acoustic equipment
industry in South Korea
(1996-2007)

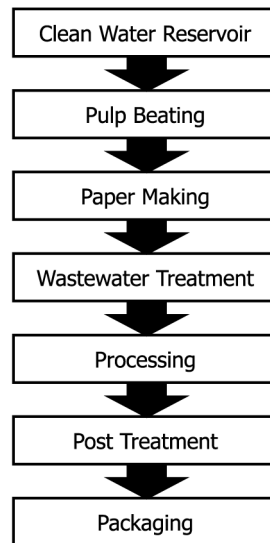


Figure 3.
Cone paper production
process

the green challenges of hazardous and solid waste generated, water consumption and recycling.

(3) *The adoption of green management.* Green management activities in the Korea Omyang began with installation of wastewater treatment facility. However, there was no organized programs until the energy savings program and the achievement of ISO 14001 certification in 2007. The ISO 14001 is the international standard that characterizes the essential elements of an environmental management system. More than 130,000 organizations worldwide have implemented standardized environmental management systems (EMSs) according to the requirements of ISO 14001 (International Standards Organization (ISO), 2006). The gaining of the ISO 14001 was obviously a challenge for the company, so the task force team (TFT) was organized and in charge of leading the ISO 14001 process and certification, mainly with members from the quality management team. Since TFT was in charge of green management, including ISO 14001 certification, the initial environmental impact assessment was also carried out to identify any improvement opportunities over production process.

The process of strategic change for green management

(i) Changes in organizational structure

As a part of environmental management system establishment process, the Korea Omyang attempted to redesign the organizational structure. First of all, the functional units of research and development (R&D), quality assurance and production were directly controlled by the managing director. These units worked together to solve the environmental problems in their products and production lines. Prior to this structural change, the organizational structure was simple as global marketing, general management, operation and production were under director control and supervision. Since the new organizational structure was established, the operational aspect of

organizational management became much more efficient through a supportive organizational climate, involving a cross-functional team/department.

(ii) Implementing environmental impact analysis

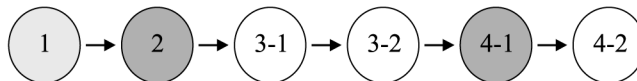
The organizational units took the first step in the environmental impact analysis over the products and production lines in order to measure and quantify the environmental impacts. Since the critical environmental challenge is caused by the glue usage, the company conducted an environmental impact analysis on glue usage every month. Figure 4 shows an example of the analysis. The procedures for conducting environmental impact analysis for glue usage are as follows.

First, it is determined which specific processes use glue, the type of glues are identified, glue supply sources, amounts of usage (kg/month), levels of impacts, costs (Korean won), and the expense of losses (by evaporation, Korean won/month). The degree of impact is indicated from 0 to 5 on an evaluation scale and conducted by all employees. The impact analysis enables the company to detect when excessive amount of glue are used, and reduce the overhead costs by minimizing glue evaporation and waste generation.

(iii) Changes in human resources

Since TFT is organized for adopting green management activities, including gaining ISO 14001 certification, the employees of other departments, such as marketing and operation, are reluctant to participate in the process of adopting green management activities. The general attitude from employees is negative because extra work-load can be imposed on them. The top management team realized this negative organizational climate and introduced training and education programme for green management, and extra incentives to attend these programme and become a part of TFT for pursuing green management and ISO 14001 certification process. During the time of preparation to obtain ISO 14001 (total 16 months), the employee attitudes to green management becomes positive and motivated to participating new green management activities including education programme for other partners.

1. Processes of glue usage



2. Identification of problems caused by glue usage

No.	Glue type	Supplier	Process #	Glue usage (kg/month)	Degree of impact	Cost (won/month)	Amount of loss (won/month)		Total
							Surplus	Evaporated	
1	A	U	1	15.57	2	7,627.8	452.4	16,209	24,289.2
2	B	V	2	11.10	3	46,207	23,723	-	69,930
3	C	W	3-1	3.27	1	3,007	446.9	3,249.6	6,703.5
4	D	X	3-2	19.32	1	18,794.4	446.9	20,364.7	39,606
...

Figure 4. Environmental impact analysis of glue usage in production

(iv) Efforts in innovation capability

After conducting the environmental impact analysis, the company reorganized the cone paper production process in order to reduce wastewater generation. In addition, the Korea Omyang invented a soluble glue alternative to rubber glue made from toluene. Although the soluble glue is about 30 percent more expensive than the rubber glue, the company decided to use the alternative soluble glue for its products. Furthermore, wooden parts have been used as a substitute for plastic, paper and metal components as part of the green management process for the corporate core product (see the summary of problem identification and green innovation in Table II).

(v) Cost savings and competitive advantage

Successful adoption of green management in the Korea Omyang produced a number of financial and non-financial benefits as a source of competitive advantage. In general, environmental impact assessment provided a quantified environmental management measure as a basis of environmental improvement for present and future operations. More importantly, superior environmental performance contributes to economic performance through sales increases (see Table III). For strategic business interests in

Problem identification	Green innovation
Lack of treatment facility by inflow increase	Quality stabilization by differentiating water consumption
Noise problem	Recycle industrial water
Cost increase by consumption raise of industrial water and chemical materials	Noise reduction
Process problem by water pressure	Construct additional tank for efficient water usage
	Reduce water and chemical material consumption

Table II.
Process innovation:
wastewater recycling and
pollution minimization

Financial investment (inputs)		Performance improvement and financial gains	
Direct costs	Environmental aspects	Cost savings (KRW/year)	Sales increase (KRW/year)
KRW 1,848 million	Established new equipments in cone paper facility	4,135,000	
	22 percent reduction of water consumption		
	20 percent increase of productivity		
KRW 36.5 million	Improved environmental process treatment	4,395,982	
	38 percent reduction of waste glue generation		
	30 percent reduction of organic solvents consumption		
KRW 475 million	Procedural improvement by new equipments and facilities instalments	49,500,000	
Total			
KRW 2,359.5 million		58,030,982	34 billion

Table III.
Financial investment and
gains by adopting green
management

Notes: The current exchange ratio is 1 EUR is equal to 1,867 KRW (*Financial Times*, 24 March 2009)

overseas markets, achievement of ISO 14001 brought a huge benefit for marketing activities. After obtaining ISO 14001 at the Korea Omyang production sites, the newly contracted overseas sales increased about 30 percent in Japan and the US. In addition, the organizational learning process was systematically settled down during the experience of gaining ISO 14001, and employee attitudes to green management became very positive. As a result, the internal resistance to change for transforming greener operations and production was substantially decreased. As it shown in Table III, the superiority of environmental and economic performance for the Korea Omyang helps the board of directors and member of staff to keep their “green” management in operations and continuous environmental improvement activities.

Case Study B. Global digital solution (GDS)

(1) General background

Global Digital Solution was established in 1981, and produces PCB (Printed Circuit Board) for electronic products manufacturers. The company has contributed to the development of the electronics industry over the last two decades. By achieving high quality components for information technology equipment, the company launched a new strategic vision to lead the company in the Asian electronics market, targeting the global PCB market with a sound information base and digital response system. Currently a total of 250 employees work for GDS in Korea.

The main products of GDS are classified as general PCBs and special PCBs. The former is a monolayered-PCB used in general electronics equipment. Special PCBs fall into five categories. These include double layer PCB, silver or copper double layer PCB for conductivity, monolayer PCB with carbon paste, and PCBs used as tuners for TV receivers or communication equipments (see Table IV for the details).

Figure 5 shows trends in the production rate since 2000, as the information technology (IT) related industries are flourishing due to digitalization, networking and mobilization globally. Communication equipment, semi-conductors, and LCD producers require more complicated and sensitive PCBs.

Product type		Product features	Usage
General	SINGLE	Printing and etching on plate → print with solder ink to prevent conduction → press punching	General electronic appliances
Special	DOUBLE	Make circuit on only one side of the plate	Low-current high-frequency TV
	STH	Circuit on both sides of plate → conduct by silver paste	CD-ROM, DVD-ROM
	CARBON	Conductive carbon paste printed between single PCBs	Remote controller, organ
	TUNER	Equivalent to single PCBs. Used for turners	TV receiver and communication device
	CPTH	Similar to STH PCBs. Copper used instead of silver for conduction	CD-ROM, DVD-ROM

Table IV.
The category of main products at the GDS

(2) Green challenges in production process

Figure 6 shows the PCB manufacturing production process of GDS. Raw materials used in the process include water, ink, hydrogen peroxide, hydrochloric acid, sodium hydroxide, and sulfuric acid. These materials cause environmental problems in water quality, air quality, solid wastes, hazardous wastes and soil pollution. The single greatest environmental challenge surrounds water quality. Thus, wastewater treatment is the critical issue for green management at GDS.

(3) Adoption of green management

The initial motivation for GDS to adopt green management was caused by the public pressure and governmental legislation regarding the municipal water supply of the region to avoid negatively affecting the local environment. In addition, buyers in national and international markets require proof of internationally acceptable environmental management systems, such as ISO 14001 and EMAS (The EU Eco-Management and Audit Scheme). Although the top management team had strong motivation to adopt environmental management in the organizational and production processes, there was an in-house culture of product quality without concerning green management commitment, and individual lack of awareness on environmental challenges.

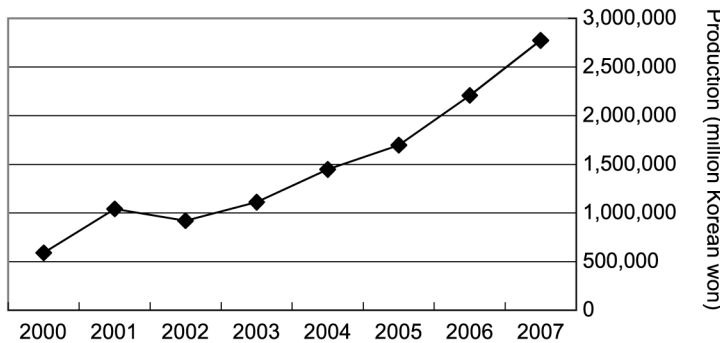


Figure 5. The volume of PCB production in South Korean market (2000-2007)

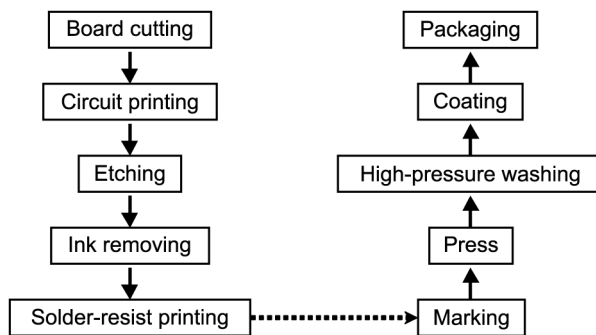


Figure 6. PCBs manufacturing process

The process of strategic change for green management

(i) Changes in organizational structure

The first environmental division in GDS was organized as an environmental team in 1998, and was changed to an “environmental management department” in 2001 and to an “environment and safety department” in 2004. There are now six staff working in the department. In terms of green management, GDS expanded its range to include soil pollution in addition to water and air quality, hazardous waste and municipal water supply, safety and fire measures. To do this, GDS hired more employees and enlarged its management scope, including waste management and toxic substance management.

(ii) Changes in human resources

Despite the recent achievement of ISO 14001 environmental management system (EMS) certification, the company experienced some difficulty in implementing the EMS at the organizational operations level due to the low level of environmental management awareness among employees. The research interview revealed that most employees felt environmental or green management was an extra workload burden. In fact, only a few people at the environmental division had to cover most of the EMS and related issues. By identifying the internal resistance against green management, the top management team has offered their full support to environmental tasks. There was a further attempt to settle into the EMS by initiating programs for employee training and internal auditing. Despite early achievement of ISO 14001, there is still slow movement among employees toward awareness and popularity of green management practices and activities.

(iii) Efforts in innovation capability

The importance of environmental effects caused by PCBs can be seen through the relationship between PCBs production quantities and wastewater discharge quantities. Over the last five years, production increased by 27 percent, but wastewater discharge increased by 43 percent. The average demand is 1,050 ton/day, 24 percent of which is recycled water. The key green issue for this is to improve usage of recycled water. For managing this, GDS has encountered some difficulties in solving technological problems on its own, thus the company asked one of its buyer companies for assistance with information, technology and managerial know-how. With external assistance for green management and its technologies, GDS can manage to improve the level of recycled water usage.

(iv) Cost savings and competitive advantage

Systematic green management reduced water demand by 21 percent, wastewater generation by 16 percent and minor material usage by 13 percent. As a result, overall production costs were reduced by 494.5 million Korean won (see Table V).

Findings and discussion

Adopting environmental management at SMEs in Korean manufacturing industry is discussed with diverse aspects in focus. One of the ways described is to gauge advancement of implemented improvements by looking at the development process of green management practices and activities.

Financial investment (inputs)	Performance improvement and financial gains			
	Direct Costs	Environmental aspects	Cost savings (KRW/year)	Sales increase (KRW/year)
KRW 120 million	Established new condenser equipments for energy savings 22 percent energy saving (5.50 KW/m ² → 4.29 KW/m ²)		422,663,261	
KRW 25 million	Improved wastewater generation 16.3 percent reduction of waste water generation (74.93 L/m ² → 62.73 L/m ²)		51,800,000	
KRW 35 million	21.2 percent reduction of water consumption (60.21 L/m ² → 47.42 L/m ²)		20,027,421	
Total KRW 180 million			494,490,682	4.2 billion

Table V.
Financial investment and gains by adopting green management

Notes: The current exchange ratio is 1 EUR is equal to 1,867 KRW (*Financial Times*, 24 March 2009)

The motivational factors to adopt environmental management are one of the key issues to understand why SMEs move toward greener management reactively or proactively. The case of Korea Omyang revealed that superiority of environmental and economic performance can be achieved by developing efficient organizational structure, technological innovation and human resources. That is, the SME considers the quality of products in terms of environmental and economic perspectives as the key success factors for their future business. In addition, customer demand is another important factor influencing the adoption of environmental management. For Korea Omyang, for example, key buyers, such as Hyundai Motors and GM, require proof of the “greenness” of manufacturers and their products as a part of procurement contracts. As a result, Korea Omyang responded proactively to gain ISO 14001 certification for customer requirements. Table VI summarized the driving factors to adopt green management at Korea Omyang case.

The case of GDS, in contrast, demonstrates a different motivation from the Korea Omyang case. There were several external pressures that lead GDS to introduce and implement ISO 14001, as parts of the production process, shortages in water supply, regulatory concerns, and market competitiveness exerted external pressures on the company. That is, environmental legislation and public pressure were the main factors behind adopting green management activities (see Table VII). GDS imposed a stringent

Internal drivers	External drivers
To reduce the ratio of employee turnover due to harsh working environment	To comply with stringent environmental regulations
To solve the wastewater treatment problem in cone paper process	To respond proactively for customer “green” demands
To reduce environmental costs	To increase “green” competitiveness for overseas markets

Table VI.
The drivers for adopting green management at the Korea Omyang

pollution emission standard on its operations as a safeguard against tightening environmental regulations.

By reflecting on the contextual factors, studies of smaller companies concluded that environmental regulations and increased customer pressure are the main drivers for green management (Perez-Sanchez *et al.*, 2003). Obviously, compliance with legal demands is the most basic environmental requirement to all businesses. Environmental regulations affect more the SMEs because smaller companies lack the necessary resources to face a much stricter regulation than the large ones. For the SMEs, the pollution prevention technology adoption process may be more difficult, due to its own complexity and the lack of economic resources (Azzone *et al.*, 1997).

According to Porter (1985) and Scherer and Ross (1990), SMEs have disadvantages with technological complexity and the experience effect. Under the legislation, companies encounter political, technological, managerial and legal challenges. These challenges cause more complex processes because of the presence of multiple norms. Thus this complexity also offers extra difficulties in managing the relations between regulators, environmental technologies, manufacturing processes and managerial procedures. Reflecting the complexity factor, it suggests that the more companies face environmental legislation, the larger the number of activities they need to develop. Therefore, SMEs may know types of relevant environmental technologies to apply to processes efficiently, and modify their organizational processes to fulfill the tasks.

Strategic and organizational characteristics for adopting green management

SMEs, as organizations, often have some advantages over large organizations in ensuring effective green management. In smaller organizations, lines of communication are generally shorter, organizational structures are less complex, people often perform multiple functions, and access to top management is simpler. All of these characteristics can be real advantages for effective green management for SMEs.

Organizational structure

In most cases, SMEs have a small number of employees and a simple organizational structure. The small number of employees often indicates a shortage of human resources, which, as has been noted, is a barrier to environmental management adoption (Alberti *et al.*, 2000; Brío and Junquera, 2003). In order to manage or adopt environmental management, it is necessary to introduce organizational change in a certain way because most SMEs have not established clearly independent teams or departments to run the environmental initiatives efficiently. One of the initial steps for SMEs is to organize a task force team (TFT) of different departmental personnel, and

Table VII.
The drivers for adopting green management at GDS

	Internal drivers	External drivers
	To solve the water quality from the wastewater treatment	To comply with stringent environmental regulations
	To reduce environmental costs	To increase "green" public image

arrange for TFT meetings on a regular basis. The case studies also support this approach. In practice, it is important to encourage TFT members and employees at different departments to submit any ideas or proposals regarding green management. Once the ideas and proposals are submitted, then the top management team can show their interest in such ideas and proposals and implement them when possible. Here, the role of the management team is very important to establish the organizational climate to bring employees' attention and interest in green management in a flexible manner. Top management support and involvement is crucial for achieving green management practices (Lee and Ball, 2003).

Innovation capability

Technological innovation can be a hard challenge for many SMEs due to a lack of financial and technological resources. In Hart's (2005) sustainability matrix, issues of pollution prevention, waste minimization and pollution control demand innovative approaches in the production process and product developments regarding green management. For example, production process improvements can bring positive results including decreases in pollutants, improvement in working place environment, and increases in productivity (Porter and van der Linde, 1996; Hart, 2005). As its green management proficiency increased, Korea Omyang was able to raise productivity by reforming the cone paper production process used in speaker manufacturing to reduce chemical use, wastewater emissions and noise pollution. The company accomplished this by installing a substitute tank outside the factory to recycle water. As a result, chemical and water usage decreased, along with discharge of wastewater. In the case of GDS, the company identified the lack of technological know-how to treat wastewater for water quality control, and sought technological inputs from large companies among their business partners. With external inputs, the company can manage to take other technological innovations for pollution control. The results of case studies presented here support Noci and Verganti's (1999) view that highly innovative SMEs, with the technological capability, can incorporate very advanced green management practices into their business operations.

Human resources

Human resources are one of the most often cited reasons by SMEs as obstacles against adopting green management. For adopting and implementing green initiatives to succeed within a company, responsible personnel must be assigned, given the means to accomplish the task provided, and allocated ample time available to perform the work. In addressing resources, it is worthwhile to note that an important characteristic of SMEs when trying to implement green management is the multi-functional nature of the staff that is assigned environmental responsibility. In other words, most environmental staff at SMEs has additional duties such as production or quality management. Thus, it would be more acceptable to employees and staff when the green management related goals and incentives are clearly identified and delivered. This study offers additional support for the work of Callenbach *et al.* (1993), in that employees are one of the critical factors needed for the successful implementation of green management.

In the case of GDS, internal resistance against green management was observed. Employees in the organization viewed green management as extra burden or an

“add-on” to their current roles. Thus, it is important for employees and top management to understand why the organization needs to adopt green management, and how the management and gaining environmental management certification such as ISO 14001 will be beneficial (Lee and Ball, 2003). As shown in the case of Korea Omyang, it is important to involve people in designing and implementing green management to help ensure the environmental management is realistic, practical, and adds value (Hutchinson, 1992; Lee and Ball, 2003).

Cost savings and competitive advantage

Transforming organizations into greener entities demands investments in technology development, employee training, and redesigning organizational structure. Many executives of SMEs fear that early investment for green management becomes an extra costs-burden only, without any financial reward later on.

In the case of Korea Omyang, 2,359.5 million KRW was invested first for performance improvement, and sales increased 34 billion KRW as a reward for superior environmental performance. Similarly, the case of GDS also showed 180 million KRW investments and 4.2 billion sales increase with 494.5 million KRW cost savings. Despite the very limited sample of two cases, these are convincing examples to answer the question “does it pay to be green?”.

When environmental performance improvement is achieved, it is critical for both the top management team and employees to realize the importance of green management. Achieving international environmental certificates such as ISO 14001 and EMAS can be a good example. More importantly, making new business contracts and/or increasing sales volume due to superior environmental performance should be addressed to employees and the top management team for continuous improvement in green management. Once green management responsiveness is viewed as involving regulatory compliance, costs, and trade-offs with other corporate goals, it is increasing being portrayed as an new business opportunity. The environmental and financial benefits of this “win-win” logic are found in this study. As Porter and van der Linde (1995) point out, an underlying logic that links the natural environment, innovation and competitiveness may bring a successful business case for sustainability at the SME level.

Implications for managers and for further research

In the long term, sustainability issues will become critically important factors for corporations to consider for their survival and competitiveness. For academic researchers and practitioners, the question of “are there competitive advantages and opportunities associated with green management?” must be delivered in order to improve our understanding on corporate environmentalism. Especially, the effects of SMEs’ environmental regulation and competitiveness should be urgently studied in business and management research because the studies between SMEs’ performance and environmental management has been rarely dealt with (Brijo and Junquera, 2003).

There are several possible explanations for the general defensive corporate response, although none of them is a sufficient excuse. Business has to decide whether it is willing to accept the challenge and become a part of the solution. The competitive advantages from turning an enterprise towards green sustainability can and should be realized. Visible environmental improvement in SMEs will not happen without suitable

stimulating factors. Based on results from this study, it is evident that environmental legislation is an important environmental trigger. However, the range of their influence is closely limited by the scope of the regulation. Evidence from this study also indicate that there is great potential for environmental improvements connected to the span of management practice including organizational learning, improving innovation capability, developing human resources, and enhancing cost savings and competitive advantage.

This paper has contributed to identify the way of strategic organizational changes towards greener management at SMEs contexts. It is hoped that some of anomalies and difficulties outlined above can be resolved by further research over a wider range of companies and in different industries. Furthermore, it is believed that quantitative research focusing on a specific industry could be very helpful in more clearly differentiating the business approaches of more proactive from reactive companies. In addition, identifying specific guiding tools and methods for measuring green management on both content and cultivation indicators should be developed. Content indicators will help identify a given company's extent of green management while cultivation indicators will provide assessments how the move towards green management is progressing.

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Further reading

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