Managing Environmentally Sustainable Innovation

Insights from the Construction Industry

Bart Bossink

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Foreword

A paradigm shift is happening at this moment. Firms and consumers are aware of the fact that they cause environmental pollution, depletion of resources and are responsible for the dangers involved. At the same time, awareness is growing that they need to, can, and will develop the appropriate solutions in the time to come. The idea that sustainable, cyclic businesses are more logical, preferable, and quality-of-life-improving than linear, consumption-oriented, and waste-dumping ones seems fascinating to a growing number of people. For this change to happen, new thinking and behavior are needed.

Firms and consumers play central roles in a sustainable business. Companies deliver what consumers buy and vice versa. In a sustainable paradigm, companies are able to develop and produce sustainably. Therefore, companies need new management concepts for, for example, sustainable investment, manufacturing, logistics, marketing, and general management.

This volume provides a management concept for sustainable innovation strategies in commercial and governmental organizations. It provides answers to the question of how people, teams, projects, companies, and governments can shape the innovation process towards sustainability while maintaining or improving a profitable financial performance. To scientists and practitioners, the volume offers a comprehensive and deep-researched theory of sustainable innovation management and a coherent overview of the possibilities to further develop sustainable innovation practice.

This volume is written for all people who are seeking ways to contribute to solutions to environmental problems, especially those who are interested in and occupied with the managerial issues. References in the text to a person or to several persons concern an audience of both women and men. For reasons of textual aesthetics, a single-gender dimensional style is chosen, for example, *he*, *she*, *his*, and *her*, instead of *(s)he* and *his/her*. In the theoretical passages, this led to a continuous use of the male reference, while in the empirical text blocks, the male form was used where it concerned a man and the female form where it concerned a woman.

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Bart Bossink
Amsterdam, February 11, 2011

Contents

	List of Figures	ix
	List of Tables	xi
	Foreword	xiii
1	**Management of Sustainable Innovation**	1
2	**Sustainable Innovation in the Dutch Construction Industry**	13
3	**Sustainable Innovation Leadership**	23
4	**Sustainable Innovation Champions**	38
5	**Sustainable Innovation Teams**	52
6	**Sustainable Innovation Projects**	66
7	**Co-innovation for Sustainability**	80
8	**Public–Private Sustainable Innovation**	95
9	**Drivers of Sustainable Innovation**	111
10	**Governmental Policy for Sustainable Innovation**	125
11	**International Issues in Sustainable Innovation**	138
12	**Conclusion**	150
	Bibliography	163
	Appendix 1: Open Interview Questions	177
	Appendix 2: Coding Labels and Categories	179
	Author's Biography	185
	Index	187

Figures

3.1 Theoretical framework: sustainable innovation leadership. 26
3.2 Analytical framework: sustainable innovation leadership. 29
4.1 Theoretical framework: championship for sustainable innovation. 43
4.2 Analytical framework: championship for sustainable innovation. 45
5.1 Theoretical framework: teamwork for sustainable innovation. 55
5.2 Analytical framework: teamwork for sustainable innovation. 59
6.1 Theoretical framework: management of sustainable innovation projects. 69
6.2 Analytical framework: management of sustainable innovation projects. 73
7.1 Theoretical framework: co-innovation for sustainability. 84
7.2 Analytical framework: co-innovation for sustainability. 87
8.1 Theoretical framework: public–private sustainable innovation. 99
8.2 Analytical framework: public-private sustainable innovation. 103
9.1 Theoretical framework: drivers of sustainable innovation. 115
9.2 Analytical framework: drivers of sustainable innovation. 119
10.1 Theoretical framework: government policy for sustainable innovation. 128
10.2 Analytical framework: governmental policy for sustainable innovation. 131
11.1 Theoretical framework: international issues in sustainable innovation. 140
11.2 Analytical framework: international issues in sustainable innovation. 144
12.1 Integrated model of sustainable innovation by individuals in teams. 151
12.2 Integrated model of sustainable innovation between co-innovating teams and organizations. 153
12.3 Integrated model of business forces that stimulate sustainable innovation. 155
12.4 Integrated model of environmentally sustainable innovation management. 157

Tables

3.1	Data Collection	25
4.1	Data Collection	40
5.1	Data Collection	54
6.1	Data Collection	68
7.1	Data Collection	83
8.1	Data Collection	97
9.1	Data Collection	113
10.1	Data Collection	127
11.1	Data Collection	139
11.2	Application Rates of Sustainable Design Options in Demonstrations	145
11.3	Application Rates of Energy-saving Options in Demonstrations	146

1 Management of Sustainable Innovation

1.1 INTRODUCTION

This volume deals with management of environmentally sustainable innovation in building. Managers, designers, builders, advisors, and clients are involved in the application of sustainable energy and material innovations in building projects. The actors in a building project cooperate in a process of consecutive phases. It starts with development of plans and continues with designing, planning, and building activities. Sustainably innovative building projects are dedicated to the cooperative creation of environmentally-friendly objects. The approach of this volume is that it uses a generic innovation management theoretical lens to focus specifically on the management of project participants and building processes in sustainably innovative building. Based on this, it develops an analytically valid theory of the management of sustainable innovation for various industries.

It offers the reader a management theory-driven analysis of sustainable construction in the Netherlands over a period of twenty years (1989–2008). It aims to be of help to researchers and practitioners who want to understand and be prepared for future development and action in this field. It presents nine studies of sustainability management and deals with specific management topics like managing individuals, groups, organizations, and collaborating organizations. It shows that in the case of sustainable building innovation, individual enthusiasm is often needed, teamwork is crucial, organizations play a pivotal role, and governmental bodies have a decisive influence.

The management aspects of sustainable building are organized in twelve chapters. Environmental sustainability is seen as an organizational innovation that needs to be managed. Sustainability management is relatively new to the world of building. Chapter 2 introduces the case of twenty years of environmentally sustainable innovation in the Dutch house building industry. In Chapters 3–11 each chapter investigates a specific managerial aspect of how Dutch building was managed for environmental sustainability. It focuses on the management of sustainability by individuals in Chapters 3 and 4. It concentrates on the influence of teams and projects

on sustainability in Chapters 5 and 6. It deals with the organizational and cooperative arrangements that are needed to realize sustainability in Chapters 7 and 8. It continues with the business environment in which sustainability has to be realized in Chapters 9, 10, and 11. Finally, it synthesizes the insights from these studies of sustainability in the construction industry into an integrated model of sustainable innovation management on all the interrelated and interwoven levels in Chapter 12. The model is based on generic theory and specific empirical research in building. It has analytical value for both building as well as other types of industry.

This chapter is organized in six sections. This introductory chapter describes the background and characteristics of the studies that follow. It starts with a brief outline of current research in the field of sustainable construction in Section 1.2. This section gives an impression of the context in which this research volume is positioned. It continues with an overview of the research questions of the studies in this volume in Section 1.3. It describes the research methodology and methods of the studies in Section 1.4. It gives an overview of the key findings of all studies in Section 1.5. Finally, it looks forward to the coming chapters in Section 1.6.

1.2 CURRENT RESEARCH IN THE FIELD OF SUSTAINABLE CONSTRUCTION MANAGEMENT

This section gives an overview of recent research into the management of sustainability in construction. A considerable amount of research is already done in the field of sustainability management. This section categorizes major outcomes of these research projects into management of sustainable construction. The three basic categories are governmental action, commercial activity, and governmental–commercial cooperation.

Governmental Action

Much research highlights that the government plays a pivotal role in the management of sustainable building. It uses environmental policy plans and environmental regulations. It tries to negotiate agreements, applies financial incentives or obstacles, and initiates demonstration projects and best practices.

According to the literature, a common practice is that governments implement national environmental policy plans to show a preferred direction for the nation, inhabitants, and businesses. These plans define the nation's sustainability goals for several years in a row (Barrett et al., 1999; Kivimaa and Mickwitz, 2006; Raynsford, 1999). Environmental policy plans have consequences for the future direction of both public organizations and private firms. In the plans, the government states what the central, provincial, and municipal authorities have to achieve in the field of

sustainability. The plans also describe what is expected of private parties in the construction industry. The plans aim and state, for example, that the government wants to cooperate with the industry to achieve large-scale results (Bon and Hutchinson, 2000). In practice this means that the government works with a national plan and that the lower authorities write their own plans, based on the governmental plan, tailored to their respective situation. These plans describe what the authorities expect from commercial firms to make progress.

A second common way of the government to promote sustainability is by issuing laws and regulations. Governments often establish prescriptive codes and certain levels of sustainable performance. Both authorities and private organizations have to work within the boundaries of these rules (Bernstein, 1996; Bon and Hutchinson, 2000; Gann et al., 1998; Guy and Kibert, 1998; Larsson, 1996; Nameroff et al., 2004; Ngowi, 2001). This method is mainly intended for companies who do not want to cooperate or implement the necessary changes. The government solves this by standardizing and prescribing environmental measures that have proven to be applicable. A general conclusion that is supported by most research is that laws and regulations primarily rely on coercion and oftentimes do not stimulate additional environmentally friendly behavior by actors in the field (Cetindamar, 2003; Cordano and Frieze, 2000; Rothwell, 1992; Tenbrunsel et al., 2000).

A third governmental practice for sustainability development is the negotiation of sustainability agreements with firms in the industry. Governments use public–private arrangements to secure a certain level of sustainability in construction practice. In these agreements, governments, for example, guarantee a part of the turnover of an entrant in the industry who produces sustainable materials or designs and builds sustainably. Another example is the government acting as a principal of a sustainable construction project. In this role, the government can accelerate sustainability initiatives and be a partner in terms of funding and design (Gann et al., 1998; Raynsford, 1999).

A fourth way for the government to influence the sustainability of building practice is through financial incentives and pressure. Governments widely use financial incentives to reward environmentally friendly initiatives and apply economical obstacles to hinder activities in unsustainable directions. An example of such an incentive is a municipal subsidy program for energy-efficient heating boilers. An example of a financial obstacle is a municipal decision to increase the costs for dumping construction and demolition waste (Bernstein, 1996; Raynsford, 1999; Wu et al., 2005). Governments' notion grows that sustainable building practices can add to customer satisfaction and the image of the builder and that builders' motivation to cooperate is growing. In the long run, this can directly contribute to growth of turnover, increase of economies of scale, and the competitive position of commercial firms in the market. This economical opportunity

is felt by a growing number of companies (Heerwagen, 2000; Larsson and Clark, 2010; Malin, 2000).

A fifth way for the government to promote sustainability is the demonstration project or best practice. Most governments that start with sustainability in construction gather with some specialist market parties to develop a demonstration project, best practice, or experiment. In the demonstration project, the participants cooperate to experiment with the possibilities. Its specific function is to show to other stakeholders what is possible. It provides valuable information about the dos and don'ts of the latest sustainability options. This knowledge can be used to learn from and to inform others. And the most successful results can be tested over and over again until they have proven to be useful and applicable in standard building projects (Buijs and Silvester, 1996; Sha et al., 2000).

Commercial Activity

In addition to this, research also shows that not only government but also some commercial firms in the industry work hard to create sustainable building practices. They do not wait for the government to come up with policy plans, regulations, or subsidies but develop and exploit their own design tools for sustainability, invest in waste reduction, or implement an environmental management system.

Literature study reveals a long list of tools that assist architects in making environmentally friendly choices in the design process. Furthermore, these design tools also help clients to assess the environmental friendliness of the architects' designs. They enable the replacement of traditional design options by sustainable alternatives. Most design tools quantify and qualify the positive and negative environmental effects of the application of building materials, energy supply, and construction methods in a design. Aspects of environmental friendliness that are considered to quantify and qualify are, for example, depletion of natural resources, deforestation, acid rain, greenhouse emissions, recyclability, toxicity, and biodiversity. Combined with other conditions like financial options, environmental regulations, and client demands, the architect can develop a building with a calculated sustainability score (Atkinson et al., 1996; Boonstra and Knapen, 2000; Bourdeau, 1999; Brandon, 1999; Bröchner et al., 1999; Lützkendorf and Lorenz, 2006; Papamichael, 2000; Rohracher, 2001). There is not a single national or international standardized sustainable building design tool (Cole, 2006). Organizations in the construction industry work with various distinctive design tools like, for example: ABGR, Accurate, BASIX, BEPAC, BREEAM, CASBEE, CEPAS, CPA, DQI, EcoEffect, EcoProfile, EcoQuantum, EMGB, EPGB, ESCALE, GBC, GBTool, GHEM, Greenstar, HKBEAM, LEED, NABERS, NatHERS, SBAT, SpeAR, and TGGS (Baird, 2009; Cole, 2000; Ding, 2008; Kaatz et al., 2006; Shiers et al., 2006; Todd et al., 2001). (For a comprehensive review of basic aspects of various methodologies see Khasreen et al., 2009.)

Research also indicates that waste management is a prominent element of firms' sustainable construction practice. Separation of waste in, for example, two to seven fractions, reuse of waste, and prevention of waste in the design phase are all receiving attention in theory and practice (Apotheker, 1990; Bossink and Brouwers, 1996; Bourdeau, 1999; Formoso et al., 2002; Gavilan and Bernold, 1994; Osmani et al., 2008; Ueda and Yamamoto, 1996). In some cases, construction firms start separating waste because of the increased costs of dumping unsorted waste. In other cases they are forced by municipal or provincial regulations to separate building waste in a prescribed number of fractions. Firms feel an economic incentive to reduce the amount of construction waste on the building site. For example the loss of materials and money due to cutting and uneconomic sizing of building materials can increase procurement costs 5 to 10 percent. Solutions in this matter contribute to both environmental as well as economical development.

Finally, a third tool used by firms is the environmental management system. An organization using an environmental management system integrates the environmental issue in its corporate strategy, business processes, and market approach (Ball, 2002; Christini et al., 2004; Hill et al., 1996; Ueda and Yamamoto, 1996). Nowadays, it is already common practice that companies have a quality system based on the requirements of the ISO 9000 series. In the 1980s the International Standardization Organization (ISO) started with a series of quality norms called the 9000 series. These norms describe the requirements a firm should meet to assure the quality of its products and services. In the 1990s this was followed up by a sort-like series of norms for environmental quality called the ISO 14000 series. This series provides the requirements a firm should meet to assure the environmental quality of its products, services, and production processes. Firms with an ISO 9000 quality system can relatively easily integrate environmental issues into their systems and additionally develop ISO 14000 environmental quality systems. Although in building there are fewer firms with ISO 14000 environmental quality systems than ISO 9000 quality systems, the number of firms with environmental management systems based on the 14000 norms is growing.

Governmental–Commercial Cooperation

A review of the literature also shows that in a few cases the government and some firms already started to cooperate in sustainable initiatives. Although these initiatives are scarce and small, their contributions to the field are considerable. These collaborative projects have several characteristics. Firstly, these sustainably innovative construction projects have the ambition to integrate sustainability in its project goals (Bernstein, 1996; Dammann and Elle, 2006; Henderson, 2007). Participants in these projects have a clear vision on sustainability, some experience and knowledge, and share the same ambitions. Most of the time, they do not stop until they

have accomplished at least some of their goals (Gluch and Stenberg, 2006; Gluch et al., 2009; Hill and Bowen, 1997). Multidisciplinary teams develop these sustainable building projects (Hill and Bowen, 1997; Ngowi, 1998; Rohracher, 2001). The organizations that participate develop new areas of competence in the field of sustainability. This enables them to work on a higher level than other organizations, giving them a competitive advantage in this market of the future. Investors in these construction projects communicate with potential customers to create selling perspectives and attract environmentally conscious customers. Often, the energy savings of the built houses are substantial and also appeal to customers who are interested in economics and financial benefits (Kua and Lee, 2002; Leaman and Bordass, 2010).

1.3 STRUCTURE OF THIS VOLUME

In this volume, sustainability is treated as an organizational innovation that needs to be managed. It starts in Chapter 2 with an introductory overview of the sustainable innovation process in the Dutch house building industry in the past two decades. It continues with nine chapters that focus on specific innovation management research topics. The research topics are ordered in terms of a widening organizational scope. It first zooms in on individuals and then widens its scope and looks at teams, at organizations and cooperating organizations, and at the business environment these organizations are in. This volume ends with Chapter 12, which synthesizes these viewpoints in a generic, integrated model of environmentally sustainable innovation management on all mentioned organizational levels.

Individuals

Chapters 3 and 4 focus on individuals who make sustainable innovation happen. Chapter 3 explains the important role, influence, and position of leaders in the innovation process. It is often said that one or more powerful or charismatic leaders from somewhere in the organization are needed to make innovation a success (Jung et al., 2008; Krause, 2004; Lloréns Montes et al., 2005). The research question of Chapter 3 asks which leadership styles contribute to the sustainable building innovation process. Then Chapter 4 explains the pivotal position of people who do not sleep until their idea is adopted in the innovation process, so-called innovation champions. It is generally assumed that it is the innovation champion who actually creates a substantive part of the renewal that is needed (Hauschildt and Kirchmann, 2001; Kim et al., 1999; Markham, 2000). The research question of Chapter 4 asks how champion roles contribute to the sustainable building innovation process.