



# PROFITABILITY OF ECODESIGN:

An Economic Analysis



January 2014

A France-Quebec collaboration



Des gens. Du savoir-faire. Des résultats.



This publication is a collaboration between

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DesJardins Conception Graphique inc.

JCBGAM Printing Solutions à Bruxelles - Printed on FSC paper

ISBN: 978-2-9537289-4-1 – Profitability of Ecodesign: An Economic Analysis  
Legal deposit – Bibliothèque Nationale de France, 2014  
First quarter of 2014

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# EXECUTIVE SUMMARY



This study investigates the profitability of ecodesign practice, five years after an initial study was conducted involving 30 companies in France and Quebec (Berneman et al., 2008). The 2008 study quite clearly suggested that companies could profit from implementing an ecodesign approach. As that first study was exploratory, however, we thought it was time to (a) examine how the situation has changed since 2008, (b) broaden the sample size to obtain more statistically robust and therefore more generalizable results, and (c) expand our investigation to try to understand why one ecodesign approach is more profitable than another.

We performed statistical analysis on new survey data gathered by means of a questionnaire. Some 750 companies were contacted and in the end, data were collected from 119 of them: 49 in France, 26 in other European Union countries, and 44 in Quebec. To our knowledge, the **survey data constitute the largest database available on ecodesign and related profitability.**

In the first, purely descriptive stage of our statistical analysis, we present the highlights of the answers to the questionnaire. With the descriptive data, we were able to draw up a profile of the typical ecodesign company and learn more about the profitability of the ecodesign approach.

In the second stage, we ran careful statistical analyses to identify the factors that determine the degree of profitability of ecodesign. Our working hypothesis was as follows: the more intense the ecodesign approach and the better the overall management of the company, the more profitable ecodesign will be. We also took into consideration certain inherent characteristics of the companies surveyed, such as their size or the industry in which they operate.

## ▶ MAIN FINDINGS

- **The ecodesign approach seems much more widely used than it was in 2008.** We were able to obtain ecodesign data from more than 90 companies in France and Quebec, whereas in 2008, we had trouble finding 30 companies to make up our sample. On average, the companies in our current sample had seven years of experience working with ecodesign.

### Profile of Companies That Take an Ecodesign Approach

- Most of the companies that practice ecodesign are in **manufacturing** (62% of our sample).
- The companies that have adopted ecodesign are profitable, innovative small businesses, recognized for the quality of their management, that cater to other businesses (B2B) or to consumers (B2C), or else to both.
- A large proportion base their practices on an **environmental standard** and use a **formal methodological tool** in their ecodesign approach.

- On average, the responding companies try to reduce the environmental impact associated with **four stages in the product life cycle**, resulting in **five types of environmental benefits**.
- Thanks to their ecodesign approach, the companies managed to improve an average of **two functional aspects** of their product.
- The **primary motivation** to undertake an ecodesign approach stems from the **personal convictions of the company's senior executive officer**, who is quite committed to sustainable development.
- Once launched, an ecodesign initiative is developed in **cooperation with several different functions** within the company.
- Around 55% of the responding companies sought **outside support** (professional or financial) to develop their ecodesign project. In Quebec, the proportion was 30%.
- Most companies say they would like **more assistance from government** to pursue their ecodesign activities.
- The vast majority of companies feel it is worthwhile **publicizing the environmental benefits** of their ecodesigned products because they consider their buyers to be well aware of environmental issues.

## Impact of Ecodesign on Profitability

- Environmental protection is generally considered to be incompatible with a company's profitability. This is not the case with ecodesign, however. For 96% of the responding companies, **ecodesign has a neutral or positive effect** on the bottom line, in absolute terms. **From a social standpoint, ecodesign is a win-win solution, as it generates environmental benefits for all, without any negative impact on profitability.** This confirms our 2008 results, but this time our sample was larger and more representative.
- **The profit margin of ecodesigned products is 12% higher on average than that of conventional products.**
- For the vast majority of responding companies, the ecodesign approach also had **positive, non-financial impacts**.
- Some variables representing the **intensity of the ecodesign approach** are associated with greater profitability. For instance, the more the **number of product life cycle stages** the company takes into consideration in its ecodesign approach, the greater the profitability. Similarly, the more methodical the ecodesign process, such as applying a formal **methodological tool**, the higher the profitability.
- Some indicators of the **overall quality of company management** are also associated with greater profitability. For example, a company that receives **outside recognition** of the quality of its management is more likely to be successful in making its ecodesign approach profitable. Also, **the greener and more functional** a company's products, compared with conventional products, the more profitable its ecodesign approach will be.
- **The smaller the company**, the greater its chances of turning a profit on its ecodesign activities. All things being equal, Quebec companies appear to have been less successful than companies elsewhere in making their ecodesign initiatives profitable.



These results have a number of **implications**, some of which are more relevant for business executives, others for policymakers.

## Implications for Business Managers

- Ecodesign is a promising strategy for improving a company's profitability. But the positive impact is more than just financial—the ecodesign approach can become a competitive advantage.
- To launch an ecodesign initiative, it is crucial for the company's senior executive officer to be convinced of its benefits and to send a clear signal to this effect throughout the organization.

## Implications for Policymakers

Since the ecodesign approach is beneficial for the environment, but has no adverse effects on the economy, **it is clearly worth promoting**.

A number of measures could be implemented to encourage its adoption:

- Set up **ecodesign awareness and training programs**, or provide better support for existing programs.
- Adopt stricter **environmental criteria** for government procurement of goods and services.
- Further develop **extended producer responsibility** programs.

These recommendations need to be acted upon more urgently in Quebec, where there seems to be less ecodesign assistance available than in Europe.

## ► FOREWORD – MFEQ

Over the last few years, manufacturers have had to adapt to new realities regarding sustainable development as the major international markets have become increasingly demanding in this regard.

Companies must now incorporate sustainable development principles into their manufacturing processes if they want to remain competitive, meet regulatory requirements and fulfill the expectations of customers, markets and society in general.

Compliance with stringent environmental and social standards, right from the outset of product development, has become a basic requirement. As a genuine driving force for innovation, ecodesign represents a strategic opportunity. Rather than a hindrance, ecodesign should be seen as an asset that prompts companies to take a proactive approach to improving their performance.

In this regard, Quebec wishes to play a leading international role. Many companies are already embracing an ecodesign approach and their experience shows just how successful it can be. The practice of ecodesign allows companies to think differently and to change their outlook and entrepreneurial culture in a way that helps safeguard the environment.

This study, the result of a successful collaboration between Quebec and France, examines the development of ecodesign practices over the last five years on the basis of a sampling of more than one hundred companies. It shows that taking environmental protection into consideration during product development not only has no adverse effects on company growth and profitability, but can actually enhance them.

In fact, around half of the responding companies in Quebec stated that the ecodesign approach had a positive impact on their profits. It therefore only makes sense, we feel, to continue to promote ecodesign and to support Quebec companies in their ecodesign initiatives.



**Élaine Zakaïb**

Minister for Industrial Policy and the  
Banque de développement économique du Québec

## ▶ FOREWORD – IDP

Despite the difficult economic situation of the last few years, we have seen that leading companies are progressively incorporating ecodesign principles into their practices. This innovation helps them to access new markets, reduce their buying and operating costs, and strengthen customer and employee loyalty.

With such successful outcomes, how can we explain then that so few companies have opted for a responsible innovation approach? Unlike in Europe, where regulations are forcing companies to change, businesses in Quebec are free to choose whether or not to incorporate sustainable development principles into their operations.

Overall, “beneficial for the environment and profitable” are still contradictory concepts for many business leaders. The persistence of this belief could partly explain why so few Quebec companies have adopted the ecodesign approach. But this may be about to change.

With the financial support of the Ministère des Finances et de l'Économie du Québec (MFEQ) and Industry Canada, the Institut de développement de produits and its French partner, the Pôle Éco-conception, have conducted a new study that provides robust statistical results to answer the question “Is ecodesign profitable?”

The study offers solid evidence that what is good for the planet and society is also beneficial for our companies. Among other benefits, ecodesigned products generate a profit margin per unit 12% higher on average than conventionally designed products.

Another interesting result is that the more intensive the ecodesign approach, the more profitable that ecodesign becomes. This finding underscores how important it is for companies to identify and implement good ecodesign management practices.

The study also shows that the ecodesign approach generates positive outcomes for innovative small businesses that go well beyond profitability, including improved company image, greater employee motivation and pride, better customer relations, and a greater capacity to develop new products.

We hope this good news will have a stimulating effect on ecodesign promoters and companies. Persuading more businesses of the many benefits of adopting an ecodesign approach will remain a major challenge over the coming years.

**Bertrand Derome**

Chief Executive Officer

## ▶ FOREWORD – ADEME

This new study confirms once again that the ecodesign approach is a win-win solution:

- A WIN for the environment because it helps companies significantly reduce the environmental impact of their products. On average, four stages of a product's life cycle (out of a total of six) are taken into consideration during the ecodesign process. The main environmental benefits are resource savings (raw materials and energy), recyclability and product reuse.
- A WIN for the economy because the approach has a neutral or positive impact on profits for 96% of companies.

While the number of companies involved in ecodesign has grown significantly since the initial study in 2008, businesses say they need outside technical or financial support and have high expectations of government to promote the adoption of the ecodesign approach.

The study findings reinforce ADEME's determination to support ecodesign initiatives, including its education assistance program, the launch of an ecodesign resources directory, and the development of local, business-linked networks to facilitate the sharing of ideas and experiences.

Today, the growing political will to foster a circular economy that encourages innovation and local development should be seen as a new opportunity to promote ecodesign.

The positive impact of ecodesign on business and the economy will be a major contributing factor to this new sustainable model.

**Lydie Ougier**

Director, Ecodesign and Sustainable Consumption

## ▶ FOREWORD – CETIM

The mechanical engineering sector has been actively engaged in sustainable development for many years now through its involvement in technological innovations that enable sustainable growth.

More specifically, the Fédération des Industries de la Mécanique (FIM), its professional unions and the Union de la Normalisation de la Mécanique (UNM), with the support of their Technical Center (CETIM), have been working to promote a pragmatic, beneficial approach to the environment.

The R&D work performed by the CETIM and the UNM01 and CEN TC406 standardization committees has led to the development of tools that industries can use to incorporate ecodesign into the products of tomorrow. These tools include the ecodesign method for mechanical products that meet the NF E 01-005 and CEN TS16524 standards, as well as the guidelines for the assessment and labeling of the environmental performance of products (carbon footprint, energy efficiency, recyclability, etc.).

In this context, the FIM had no hesitation about supporting this study, which provides valuable insights into companies' ecodesign experiences and the associated economic benefits they have derived in recent years.

We were happy to see that the study results confirm that businesses stand to gain from taking an ecodesign approach. For the vast majority of participating companies, ecodesign had not just financial benefits, but also other positive impacts, such as raising the company's profile, better customer relations, and increased employee motivation.

The study also shows that there is still a huge need to explain and raise awareness about ecodesign. There are still many challenges ahead! They will be tackled in a way that meets the needs of both companies and their customers, by offering them tailored, practical solutions.

### **France de Baillenx**

Director, Environment  
Fédération des Industries Mécaniques  
Chair, UNM01 "Mechanics & Environment" Committee

## ► FOREWORD – PÔLE ÉCO-CONCEPTION

The editorial of the very first issue of MyGreenMag, a magazine launched by our association in 2013 and devoted entirely to ecodesign, was titled “Ecodesign, the end of the pioneer age, the beginning of maturity.” This observation was based on our Pôle’s everyday experience dealing with small businesses and the information we collected from them in the course of our awareness and knowledge-transfer activities.

This study on the profitability of ecodesign confirms our observations, but also provides a scientific basis for them. Ecodesign has moved forward from the pioneer age to a time of wider dissemination and is now part of an accepted economic model. The study results show that the profitability of the ecodesign approach is tied to companies’ ability to develop solutions that meet all of customers’ expectations, expressed or not, while continuing to enhance product functionality. This creation of added value can be seen as a way of defining the ecoinnovation of products and services.

In the age of the circular economy and sustainable modes of production and consumption, the goal is to create value that is shared by both the end consumer, who enjoys greater utility value, and the producer, who benefits from its ecodesign innovations at every stage of the value chain. The positive externalities resulting from the ecodesign approach must also be taken into account, as noted by the companies that took part in this study. After all, the purpose of a company is to create, and recoup a share of, this added value.

### **Christian Brodhag**

President, Pôle Éco-conception  
Director of Research  
École Nationale Supérieure des Mines de Saint-Etienne

## ▶ ENEC INTRODUCTION TO THE COST-BENEFIT ANALYSIS DOCUMENT

### “THE EUROPEAN NETWORK OF ECODSIGN CENTRES PROVES THE PROFITABILITY OF ECODSIGN”

We, the European Network of Ecodesign Centres (ENEC), share our experiences, knowledge, and best practice on all aspects of ecodesign to ensure more companies can make ecodesign happen.

In 2013, our partner Pôle Eco-Conception initiated the second stage of its study to assess the Cost-Benefit Analysis of ecodesign. Here, ENEC partners share our experiences of conducting the study in parallel, in each of our regions.

**Why?** Investing in ecodesign products is a major strategic shift for most companies. Understandably, people and organisations fear changes if tangible advantages are not clearly evident. European countries have different company cultures, national markets, political and social developments and policy landscapes. By taking a unified approach to this study, we anticipated results that prove ecodesign is consistently good business, regardless of these diverse circumstances and conditions throughout Europe.

Importantly, in 45% of our case examples ecodesign increases company profits. For 51% the impact is neutral. We see increases as high as 12% in profit margin. In addition, a large majority of respondents said that an ecodesign approach had provided them with benefits other than financial. For example, 86% of companies see brand enhancements, 46% see increases in staff motivation and 41% identify improvements in relationships with customers. All this was achieved at the same cost or slightly higher cost of product development.

Collectively, ENEC works with 415 companies across Europe on ecodesign products. Based on our day-to-day experience with industry, we propose that not all companies always have high profits. The organisation Swerea has recently published similar conclusions in its report on “Why use Ecodesign in the industry? A Survey regarding Barriers and Opportunities related to Ecodesign” (2013). Ecodesign can boost the profitability of a product, but like any other product, an ecodesign product does not automatically have market success.

To-date most legislation targets single issues, such as the energy-efficiency regulation of energy using products. While this is beneficial, it risks other environmental concerns going unaddressed. Still, most companies adopt this single-issue approach and very few take a holistic view. In pro-active companies, personal motivations of top management and key individuals drive ecodesign forward. Often, they perceive it is profitable, but rarely follow through with support and resources for their organisations. Purchasing and marketing departments also have central roles, but are not appropriately educated. Finally, pro-environmental attitudes and behaviour are critical to embed ecodesign in the long-term in European businesses.

In this study, we conclude that the main drivers for ecodesign are customer requirements; therefore huge opportunities remain for policymakers addressing ecodesign.

The ENEC partners extend special thanks to the team at Pôle Eco Conception and the Canadian Benchmark for developing the questionnaire and leading the assessment.



## ▶ PERSPECTIVES – ENEC PARTNERS ON THE STATE OF ECODESIGN IMPLEMENTATION IN THEIR REGIONS



**Diarra KANE** - Pôle Eco-conception (France)

Project manager of the study on the profitability of ecodesign for Europe part, asks its ENEC partners about the ecodesign vision of each of the centers on their territory.



### Is there real profit for companies doing ecodesign?



There definitely are profit-making opportunities. Simple costs savings are easily realised through ecodesign strategies like material reductions, product improvements, better waste management and resource efficiency.

However we need to consider the distinction between profits gleaned from incremental re-design of existing product or processes, verses ventures into new markets or business model innovation, which are perceived as high risk. Traditionally ecodesign has focused on re-design to improve product lifecycle performance through resource efficiency, which increases profit margin by reducing cost rather than extending value. The long-standing barrier of uncertain return on investment or extended payback time, and difficult market conditions has heightened risk-averse business thinking.

**Dr Sharon Prendeville**  
Ecodesign Centre (Wales)



A lot of companies that are perceived as sustainable working companies are often very wealthy. But just producing a single ecodesigned product makes companies neither successful nor profitable.

**Michael Niemczyk**  
EFA (Germany)





## What markets are driving ecodesign in your regions? Why?



In the Basque Country with a GDP of 22% most companies are business-to-business product manufacturers: machinery, ancillary equipment and power supply, automotive and aerospace components. These highly competitive markets are interested in weight reduction, hazard and energy efficiency, and measuring the environmental footprint in the product value chain. Other ecodesigning sectors are furniture and construction materials to reduce costs and are therefore more attractive to customers in Europe mainly in the Nordic countries, Germany, United Kingdom, France and even the BRIC countries.

**Josean Galera**

Department of Environment and Land planning  
(Basque Country)



In Flanders we perceive the design sector itself as a driving force. Designers and design agencies can convince companies of the benefits of implementing ecodesign. Results from the 2011 Community Innovation Survey in Belgium shows that only 20% of the companies active in product innovation put 'environment' in their targets. Another related survey shows that more than 30% believe there is a lack of social and environmental attention in their product ranges. So there is still a large potential.

**Evelyn Lafond**  
OVAM (Flanders)



## What is still to do in your region to push ecodesign?

- ➔ We need to facilitate strategic decision-making in Basque companies. We supply information from within the European Commission relevant to the international market in the field of ecodesign and product environmental footprints. To liaise closely with companies and let them see business opportunities is another challenge. We need to continue to coach companies through collaboration with the Basque Ecodesign Center and sectoral clusters.

**Josean Galera** – Department of Environment and Landplanning (Basque Country)



- ➔ From a policy perspective, we have made a lot of progress. The next stage is to deliver on policy commitments. This requires that business service providers are properly equipped with knowledge and tools to support ecodesign uptake in industry. We also need better awareness raising and easier access to business support. There are lots of funding options in Wales but small business still struggle to avail of them.

Two other key areas that need to be addressed in Wales are design education and the development of 'waste' infrastructure that prioritises reuse and remanufacturing. We need investment in physical reuse and remanufacturing hubs but we also require skills. While ecodesign is embedded in some education courses, it is not consistent and many design students are emerging from university without necessary ecodesign competencies.

**Dr Sharon Prendeville** – Ecodesign Centre (Wales)



- ➔ Ecodesign needs to be integrated into the education curricula of designers and engineers to establish basic knowledge. Furthermore the advantages of environmentally preferable products need to be present in daily communication with industry, as well as what environmentally friendly products are already available to consumers. Through a greater push more companies will be motivated to integrate ecodesign approaches into their product development processes

**Michael Niemczyk** – EFA (Germany)



## What is going on at policy level in your region that could boost Ecodesign?

- ➔ We want to position Flanders as a top European region in the field of sustainable materials management through a Flemish Materials Programme. In this programme, companies, authorities, knowledge institutions and civil society join forces and combine ambitious long-term vision development, policy-relevant research and concrete actions. This is done respectively within Plan C, SUMMa (Policy Research Centre for Sustainable Materials Management) and an operational 2020 action plan with 9 levers and 45 priority and concrete actions. One of the levers is ecodesign. The Flemish Materials Programme has brought ecodesign higher up the policy agenda.

Another strategy to boost ecodesign is to lobby for minimum and binding ecodesign requirements (for energy, material and broader environmental aspects) at a EU-level. This is, however, a long-term process.

And of course we firmly believe in ENEC as a way of demonstrating the importance of ecodesign for every company throughout Europe.

**Evelyn Lafond** – OVAM (Flanders)



- ➔ As we are the Basque Government, we have focused our ecodesign efforts over the last 15 years in capacity building. This means training skills, recognising green companies via ISO 14.006 Ecodesign Management Certification (the first "Basque Country" ISO standard) and coaching SMEs in the greening of products and services.

Now 157 Basque companies are already ecodesigning. On the ground, we have the Basque Ecodesign Center, a Public-Private Partnership with 8 multinationals companies that are committed to "Green Supply Chain Management" of products and services – the best way to incentive SME to ecodesign.

**Josean Galera** –Department of Environment and Landplanning (Basque Country)



## Why is ecodesign so difficult to introduce in your regions' companies if the benefits seems so high?

- ➔ The key problem is already mentioned in the question. Ecodesign seems to have benefits, but up until now there is still no clear evidence for individual companies that ecodesign does actually boost their business. Companies primarily have financial goals and few companies tend to have explicit socio-ethical or environmental goals. Research recommendations (OVAM-study on the Potential of Ecodesign) clearly point towards the need for best practice examples that convincingly show economic advantages and therefore need to be developed by CEO's and company leaders themselves.

**Evelyn Lafond** – OVAM (Flanders)



- ➔ While the benefits of ecodesign are clear to proponents of it, demonstrating these to the wider business community has been challenging. The reasons for this are many and varied. Companies still associate high costs with efforts to improve environmental performance. We need to dissolve these barriers through cases effectively quantifying the financial value of waste valorization and eco-innovative business models. Most importantly, these need to be integrated with existing business concepts (risk management, return on investment).

In Wales, we have the typical exemplary companies that are driven by motivations of senior figures. Many companies are still complacent, or do what they do because it is perceived as the most profitable way of doing it – it is the well-versed 'business-as-usual mentality'.

While there is a design community in Wales, many manufacturing companies have little control over design aspects, with head offices that are often overseas. Design can be hard to internalise, particularly for small companies that have short-term priorities and limited resources.

**Dr Sharon Prendeville** – Ecodesign Centre (Wales)



- ➔ North-Rhine Westfalia is a highly industrialised area. Its industry is dominated by metalworking, steel production and chemical industry. The majority of industrial activity is therefore business-to-business and not directed towards the private end user. Most of the companies find themselves somewhere in the supply chain and they see their control over the final product design as very limited. For this reason they do not look into ecodesign.

For a lot of other companies it is not clear what ecodesign really means for them. For example machine production companies look into reducing energy consumption of their products (machines) during the usage phase. But as these companies limit their activities to this and it is a one-dimensional approach; they are reluctant to call this ecodesign.

**Michael Niemczyk** – EFA (Germany)



# ACKNOWLEDGMENTS

This study on profitability and ecodesign is the result of a France-Quebec collaboration initiated by a partnership between the Pôle Éco-conception et Management du Cycle de Vie and the Institut de développement de produits (IDP). Since 2009, the two organizations have been working together to support industry in its efforts to boost the success of its responsible innovation initiatives.

We would like to acknowledge the creativity, rigor and tenacity of the researchers, who successfully assessed the impact of the ecodesign approach on company profitability and identified the success factors involved. To their knowledge, this study is the first of its kind in the literature. We wish to extend our thanks to all four of them:

**Naciba Haned**, Professor and Researcher, ESDES, Université Catholique de Lyon  
**Paul Lanoie**, Professor of Economics, HEC Montréal  
**Sylvain Plouffe**, Professor of Design, School of Industrial Design, Université de Montréal  
**Marie-France Vernier**, Professor and Researcher, ESDES, Université Catholique de Lyon

We would also like to thank our funders and partners for their commitment and financial support:

Agence de l'Environnement et de la Maîtrise de l'Énergie (ADEME)  
Centre Technique des Industries Mécaniques (CETIM)  
Conseil Général de la Loire  
CCI de Saint-Étienne / Montbrison  
Ministère des Finances et de l'Économie du Québec (MFEQ)  
Industry Canada

We also wish to extend our thanks to the project coordinators, Natalie Blouin and Diarra Kane, for overseeing the study, as well as to our many contributors, both in France and Quebec, who spared no effort contacting some 750 companies in several countries.

Special thanks also to the European Network of Ecodesign Centres (ENEC) and to RONA, a Canadian distributor and retailer of hardware, building and home improvement products, that helped us to identify eligible companies for the study.

Finally, we wish to thank all the companies that took the time to complete the study questionnaire. They helped create the largest database now available on ecodesign and profitability. We hope their ecodesign initiatives will serve as an inspiration to others.

**Samuel Mayer**  
Chief Executive Officer  
Pôle Éco-conception  
et Management du Cycle de Vie

**Bertrand Derome**  
Chief Executive Officer  
Institut de développement de produits

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## ▶ RESEARCHERS' ACKNOWLEDGMENTS

The researchers would sincerely like to thank the Institut de développement de produits (IDP), represented by Natalie Blouin, Bertrand Derome, and Camille Ouellette, as well as the Pôle Éco-conception et Management du Cycle de Vie, represented by Samuel Mayer, Diarra Kane, and Abderezak Ghenai, without whom this study would not have been possible. The researchers would also like to thank the Ministère des Finances et de l'Économie du Québec (MFEQ) represented by Nicole Dionne, as well as Industry Canada represented by Lisa Charette and Louise Chandra, for their financial support. They also extend their thanks to the ADEME and the CETIM for their cooperation in recruiting companies for the study and the funding provided. Finally, the researchers would also like to express their sincere gratitude to Philippe Lemay for his invaluable assistance with the design of the online questionnaire and the data analysis.





# INTRODUCTION

Ecodesign is an increasingly widespread practice in manufacturing companies. In Quebec, the Institut de développement de produits (IDP) has been providing ecodesign training since 2007; some 500 companies have attended the training sessions, and prediagnoses were performed for more than 100 of them. In France, through the Pôle Éco-conception, around 2,000 companies have benefited from ecodesign awareness programs and 560 prediagnoses have been completed over the last five years.

One fundamental question has remained unanswered, however: **Is ecodesign profitable?** The lack of reliable information about the profitability of ecodesign continues to deter many companies from incorporating this approach into their operations.

## ▶ 2008 Study

The Institut de développement de produits, in cooperation with the Pôle Éco-conception, tried to answer this question in 2008 by conducting a first exploratory study with a sample of 30 companies equally divided between France and Quebec (Berneman et al., 2008).

This groundbreaking study provided an overview of companies that were implementing ecodesign and assessed what impact it was having on their profitability. The results showed that ecodesign had led to increased profits at 28 of the 30 companies studied. In the two other cases, no impact on profitability was seen.

Although the results of the exploratory study were promising, the small sample size limited the generalizability of the findings.

## ▶ 2012 FOLLOW-UP SURVEY

Between July 2012 and February 2013, the same 30 companies that took part in the 2008 study were contacted again as part of a follow-up survey. Eighteen of them responded.<sup>1</sup> The results confirmed that ecodesign was still profitable for them and that they had stepped up their efforts to incorporate ecodesign principles.

## ▶ 2013 STUDY

As the 2008 study was exploratory, we decided for the 2013 study to (a) examine how the situation has changed since then, (b) broaden the sample size to obtain more statistically robust and therefore more generalizable results, and (c) expand our investigation to try to understand why one ecodesign approach is more profitable than another.

Details about the study methodology and the econometric model can be found in Section 2 of this report. The study results are presented in Section 3, in two parts: first a descriptive examination of the sample, followed by a more in-depth analysis. In the conclusion, we discuss our findings and their main implications for companies and policymakers.

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<sup>1</sup> See Lanoie et al., (2013).





# METHODOLOGY

## ▶ 2.1 Data

To meet the objectives of this study, we opted for a statistical analysis of primary data from our own survey. Initially, our aim was to collect data from at least 100 companies. As ecodesign seemed less common in Quebec than in Europe, we set our survey objective at 40 companies in Quebec and 60 in Europe.

Given this targeted sample size, it was no longer possible to conduct semi-structured interviews on site, as was done in 2008. Instead, we decided to use an online questionnaire that company representatives could fill in themselves or that we could fill in while asking them the questions over the phone. Some respondents chose to send back the questionnaire by email or regular mail.

The **questionnaire** consisted of 48 questions, the majority of which were multiple choice. It took around 40 minutes to complete and was divided into four sections.

The first section covered the “general characteristics of the company.” The purpose was to collect basic information on the company and its operating environment: its size, industry, clientele, R&D spending, and the recent trend in sales and profits.

The second section dealt with the “history of ecodesign in the company.” As one of our research hypotheses concerned the impact of ecodesign experience on company profitability, it was essential to find out about its ecodesign history: when and why the ecodesign approach was introduced, the number of projects completed, etc.

The questions in the third section focused specifically on an “ecodesigned product representative of the company,” chosen by the respondent and that met the following criteria: an ecodesigned product that had been on the market for at least one year and that had contributed the most to the company’s sales.

The purpose of these questions was to find out more about the environmental qualities of the products, as our hypothesis was that the more systematic the ecodesign approach, the more profitable it would be. For example, at which stage of the product life cycle had the company sought to reduce the environmental impact? What were the environmental advantages of the ecodesigned product compared to a similar product developed in a conventional manner? In this section of the questionnaire, we also asked about the tools used to implement ecodesign, environmental certification of the product, support received from public agencies for ecodesign development, how the product’s environmental benefits were promoted, etc.

The last section of the questionnaire sought to measure the profitability of the representative ecodesigned product. Did the product increase the company’s profits and profit margin more than a conventionally developed product would have? We also wanted to know whether the ecodesigned product had had positive impacts other than financial, such as an increased capacity to innovate or greater employee motivation.

The survey was conducted between March 15 and October 1, 2013.

Originally, any company in Quebec or France with experience in ecodesign was included in the population targeted for data collection. We tried as much as possible to generate a random sample of companies.

In **France**, we started with four different lists of companies:

- 150 members of the Pôle Éco-conception: companies of different sizes, operating in different industries, not all of which take an ecodesign approach;
- 170 companies from the Pôle Éco-conception’s “prospects” list: companies of different sizes, operating in different industries, that are not members of the Pôle, but have been identified as being interested in ecodesign or ecoinnovation, or ready to try out an ecodesign or ecoinnovation approach;
- 100 companies (of different sizes and operating in different industries) that had requested ecodesign project funding from the ADEME [environment and energy management agency];
- 80 companies (of different sizes) associated with the CETIM [technical center for mechanical industries], an agency that works closely with the Pôle on ecodesign.

These 500 companies were all contacted about the study, and follow-up was done. Greater effort was put into following up with companies belonging to the Pôle and companies that received funding from the ADEME. In total, 49 companies took part in the survey, with half of them completing the questionnaire online.

The Pôle also approached its partners, members of the European Network of Ecodesign Centres (ENEC), about helping with the study. Each partner was asked to conduct at least 10 interviews over the phone. From a questionnaire translated into English, interviews were conducted in Spanish, German, and English. A total of 26 companies responded to the survey this way:

- Ilobe-Department of Environment in the Basque Country: 16 questionnaires have been made and included in study in the column of the European results. 29 others have been received in a second step. Those last results are showned, in some cases, in a specific column called Basque Country;
- OVAM and UCM in Belgium: 9 interviews in Flanders (3 in French and 6 in English);
- EFA in Germany: 5 interviews, but all incomplete and therefore unusable;
- Ecodesign Centre in Wales: 1 interview.

In **Quebec**, the study was commissioned by the IDP, which promotes ecodesign and responsible innovation. Companies were recruited first from a list of around 100 organizations who were IDP members or had taken part in ecodesign-related activities. The pool of possible companies for the study was then expanded through:

- Monitoring by IDP members and project researchers, which helped identify some 60 additional companies. For example, we solicited the winners of the NOVAE<sup>2</sup> ecodesign contest, firms that took part in our 2008 study, and other companies featured in newspapers or at conferences because of their ecodesign achievements;
- A list of around 30 suppliers of RONA, a network of home hardware stores that has developed an extensive range of ecodesigned products; about half of its suppliers are based outside Quebec;
- A list of around 10 Canadian companies engaged in ecodesign and identified by Industry Canada.

In total, around 200 companies were contacted after being deemed eligible, i.e., they had to have put at least one ecodesigned product on the market.

A special effort was made to reach companies outside Quebec; around 10% of the companies contacted were based in other Canadian provinces.

Thanks to survey follow-up, 44 companies completed the questionnaire. The majority of the respondents (73%) did so online, while the remaining companies filled in the questionnaire over the phone. Despite our efforts, only one company outside Quebec, based in British Columbia, completed the questionnaire. Given that this company also has business operations in Quebec, we chose to include it in that geographic category.

In summary, while around 750 companies were contacted, the final sample consisted of 119 in all: 49 in France, 26 in other European Union countries, and 44 in Quebec.

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2 NOVAE: <http://www.novae.ca/>

## ▶ 2.2 Econometric Model

The question this study set out to answer was “What makes ecodesign more profitable in one company than another?” Our objective was therefore to identify the explanatory factors (independent variables) responsible for this profitability (dependent variable). The econometric model we used was the following:

$$\text{PROFITABILITY}_i = F(\text{INTENSITY}_i, \text{QUALITY}_i, X_i, \mu_i)$$

where  $\text{PROFITABILITY}_i$  is a measure of the profitability of ecodesign in company  $i$ ;  $\text{INTENSITY}_i$  is a vector of independent variables representing the intensity, scope, or scale of the ecodesign approach;  $\text{QUALITY}_i$  is a vector of independent variables representing the “overall” quality of the company’s management;  $X_i$  is a vector of control variables; and  $\mu_i$  is an error term representing unobservable variations.

There are three categories of independent variables. With respect to the first category ( $\text{INTENSITY}$ ), we postulated that the more systematically ecodesign is done, the easier it is to identify opportunities to make it profitable. This hypothesis was based on our 2008 exploratory study, which showed that companies that applied ecodesign at several stages in the product life cycle tended to have more profitable results. For the second category ( $\text{QUALITY}$ ), our rationale was that, all other things being equal, the better the quality of management, the greater the profitability (Porter and van der Linde, 1995; and Reynaud, 2003). The third category consisted of control variables representing company size, industry, location, clientele, etc. They allowed us to determine, for instance, whether ecodesign is more profitable when a company caters to consumers (B2C) or other businesses (B2B), whether there are economies of scale associated with company size, or whether factors specific to certain industries have an impact on profitability.

### 2.2.1 Dependent Variable

Three of the questions on the questionnaire concerned the profitability of ecodesign: (1) Question 41 asked respondents whether ecodesign had helped increase the company’s profits, in absolute terms; (2) Question 42 asked whether the profit margin of the ecodesigned product was different from what it would have been for a conventionally designed product; and (3) respondents who said, in answer to Question 42, that there was a profit margin differential were asked, in Question 43, to give an estimate (in percentage terms) of the differential.

For the purposes of the study, the method used to measure the level of profitability of companies that were taking an ecodesign approach was as follows: the variable  $\text{PROFITABILITY}$  was defined as the sum of variables 41 and 42, because the dispersion of the two variables was so great that the raw data were unusable.<sup>3</sup>

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3 To sum the variables, we first coded the five items of questions 41 and 42 as follows: the first item was given a value of -2, the second -1, the third 0, the fourth 1, and the fifth 2. Second, we created an ordered variable and gave it a value of 1 if the sum of variables 41 and 42 was negative, a value of 2 if the sum was 0, and a value of 3 if the sum was positive.

## 2.2.2 Independent Variables

Company environmental performance is often explored on the basis of case studies that identify several determining factors involved in ecoefficiency. Market and organizational factors are usually considered to be major levers of efficient, proactive environmental policies (Russo and Fouts, 1997). Consequently, we opted for variables representing the intensity of the ecodesign approach and the overall quality of company management.

### i. Variables Representing Intensity of Ecodesign Approach

With respect to the main hypothesis, we used 11 variables to capture 9 dimensions of the intensity of the ecodesign approach. For each dimension, our expectations or hypotheses regarding the results are set out below.

*Ecodesign experience* (EXPERIENCE<sup>4</sup>). A learning curve applies to the ecodesign approach (Lindahl, 2001); generally, the farther along on the curve, the more intense and the more profitable the approach should be (Jackson, 1998). On the other hand, those new to ecodesign can make significant gains ("low-hanging fruit") in a short period of time, as our 2008 study suggested. The answer to the question "What impact does ecodesign experience have on profitability?" is therefore empirical.

To measure experience, we asked three questions: (1) Question 15 asked respondents whether the product developed by the company was its first experience with ecodesign; (2) Question 16 asked them to indicate their number of years of experience with ecodesign; and (3) Question 17 asked them how many ecodesign projects they had completed in the last three years. Ecodesign experience was the sum of the answers to questions 16 and 17.

*Motivation to undertake the approach* (MOTIVATION). For questions 19, 20, and 21, we listed the main reasons (11 possible choices) that might prompt a company to undertake an ecodesign approach. Close to 75% of the respondents said that the "personal convictions of senior managers" played a decisive role. A whole body of literature suggests that impetus from senior management is crucial to the success of any organizational change (see Doonan et al., 2005). We therefore postulated that companies where motivation of that kind was fully in evidence probably had more encouragement to succeed with their ecodesign approach and make it profitable. After reviewing the data, we decided to add two more variables related to motivation: MOTIVATION2 represents the search for new markets as the second reason given for undertaking an ecodesign approach, while MOTIVATION3 represents the search for savings or new markets or the anticipation of new regulations as the third reason given. These two major types of motivation should be related to profitability.<sup>5</sup>

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4 The terms written in capitals are the names of the variables used in the subsequent sections and tables.

5 Three variables were used: MOTIVATION1 was given a value of 1 if the main reason for undertaking the ecodesign approach was the personal convictions of senior managers, and a value of 0 if it was another reason. MOTIVATION2 was given a value of 1 if the second main reason was the search for new markets. MOTIVATION3 was given a value of 1 if the third reason indicated was the search for savings or new markets or the anticipation of new regulations.

*Environmental certification (CERTIFICATION).* In Question 25, respondents had to indicate whether the developed product met a standard, a regulation, or some type of environmental labeling.<sup>6</sup> A product awarded an environmental certification is a sign of a systematic approach and a mark of quality for customers. These two elements should have a positive impact on profitability (see Kok and Kahn, 2012). However, obtaining environmental certification can be a long and expensive process, as observed in our 2008 study. On a purely theoretical level, it is impossible to predict whether the certification will have a positive or negative impact on the profitability of the ecodesign approach. We needed statistical analysis to answer that question.

*Life cycle stages (CYCLE).* In Question 27, respondents were asked which stages in the product life cycle (production, storage, transportation, end of life, etc.) were taken into consideration during ecodesign. The higher the number of stages, the higher the probability the ecodesign approach will be profitable.<sup>7</sup> Our 2008 study suggested as much, as does Standard ISO 14062.<sup>8</sup>

*The new product's environmental benefits (BENEFITS).* Two companies may have worked on the same number of stages in their product's life cycle, but one may have done it only superficially compared with the other. The company with a more systematic approach is more likely to generate more environmental benefits than the other. In Question 31, respondents were asked to indicate all the environmental benefits that their ecodesigned product had over a conventionally designed product. The greater the number of environmental benefits,<sup>9</sup> then the higher the chances of streamlining production, the better the product's environmental image on the market, and the higher the profitability.

*Methodology (METHODOLOGY).* In Question 28, respondents were asked whether they had used a methodological tool in their ecodesign approach.<sup>10</sup> The more a company's ecodesign approach is systematic and formally organized, the more profitable it should be.

*Integration of ecodesign into the different functions within a company (INTEGRATION).* In Question 35, respondents were asked to state which of the company's functions (senior management, R&D, marketing, production, etc.) were involved in the ecodesign approach. We postulated that the more the ecodesign approach was integrated into the different functions,<sup>11</sup> then the easier collaboration would be, the more synergy there would be, and the more profitable the approach would be (see Doonan et al., 2005).

*Outside support received (SUPPORT).* If the company received support for its approach from an outside organization, it probably contributed to its profitability, especially if the expertise was not available within the company. In Question 36, respondents were asked whether they had received financial or other support from public or professional organizations for their ecodesign approach.<sup>12</sup> A positive answer was deemed to increase the likelihood of profitability.

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6 The variable was given a value of 1 if the answer to Question 25 was yes; if not, it was assigned a value of 0.

7 The variable was given a value from 1 to 7 depending on the number of life cycle stages taken into consideration.

8 [http://www.iso.org/iso/home/store/catalogue\\_tc/catalogue\\_detail.htm?csnumber=33020](http://www.iso.org/iso/home/store/catalogue_tc/catalogue_detail.htm?csnumber=33020)

9 The variable was assigned a value from 1 to 14 depending on the number of environmental benefits produced by the ecodesign approach.

10 The variable was given a value of 1 if the answer to Question 28 was yes; otherwise, 0.

11 The variable was assigned a value from 1 to 6 depending on the number of functions involved.

12 The variable was given a value of 1 if the answer to Question 36 was yes; otherwise, 0.

*Environmental communication* (COMMUNICATION). All other things being equal, companies that emphasize the environmental benefits of their ecodesigned products in their communications (ads, articles, etc.) should have more success in reaching customers aware of sustainability issues and therefore in increasing their profits. In Question 33, respondents were asked whether they promoted the environmental qualities of their products in their marketing campaigns. Companies that do so should be more profitable than those that do not.<sup>13</sup>

## ii. Variables Representing Quality of Company Management

All other things being equal, better managed companies should be better able to take advantage of ecodesign to boost their profits. We used five variables to capture this dimension.

*Profitability* (PROFITS). A company's recent profitability is no doubt a good indicator of the quality of its management. In Question 11, respondents were asked how the company's profitability had changed over the past three years. However, after doing a number of preliminary estimates, we decided to disregard this variable, as it substantially reduced the explanatory power of the regression. Since profits are always a sensitive issue for companies, the data may not be very reliable.

*Innovation* (R&D). Innovation is one of the keys to business success (see Bogliacino and Pianta, 2013). Changes in R&D spending can serve as an indicator of innovation. Question 12 asked respondents about the trend in their R&D expenditures over the last three years.<sup>14</sup>

*Product quality* (FUNCTIONALITY). Similarly, innovation can lead to improvements that make the product more attractive to buyers and contribute to its profitability. This is what our 2008 exploratory study indicated: the more a company added functional qualities to its product, the more profitable the ecodesign approach appeared to be. In Question 34, we asked respondents to identify the functional advantages for the user of their ecodesigned product when compared with a conventional product (more economical to use, easier to maintain, lighter, more ergonomic, etc.).<sup>15</sup>

*Outside recognition* (RECOGNITION). The opinion of an independent third-party organization can be a good way to assess the quality of a company's management. In Question 13, respondents were asked whether their company had received certification or an award in the last three years in recognition of the quality of its management or products.<sup>16</sup>

*Commitment to sustainable development* (COMMITMENT SD). There is growing acceptance that taking a path towards sustainable development can improve a company's performance (Porter and van der Linde, 1995; Ambec and Lanoie, 2008). In Question 23, respondents were asked to rate their senior management's level of commitment to sustainable development.<sup>17</sup>

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13 The variable was assigned a value of 1 if the answer to Question 33 was yes; otherwise, 0.

14 The six items in Question 12 were given values from 1 to 6 depending on R&D growth over the past three years.

15 The variable was given a value from 1 to 7 depending on the number of functional advantages identified.

16 The variable was assigned a value of 1 if the answer to Question 13 was yes; otherwise, 0.

17 The five items in Question 23 were given values from 1 to 5 depending on the level of commitment.

## 2.2.3 Control Variables

Here, too, five variables were used.

*Size* (DT1, DT2, DT3, DT4). The size of a company can have various impacts on its profitability. On the one hand, larger companies may be able to leverage advantages that help make the ecodesign process more profitable. For example, if their product range is broader, they may be able to benefit from economies of scale by simultaneously applying the same ecodesign innovations to several products. Furthermore, larger companies usually find it easier to obtain financial capital and to attract a more diversified workforce, which facilitates the integration of ecodesign practices, etc. On the other hand, smaller companies can be more flexible and consequently better able to seize profitable business opportunities, as our 2008 study suggested. On a theoretical level, it is impossible to predict whether a company's size will have a positive or negative impact on ecodesign profitability. Statistical analysis is needed to answer that question. We measured company size by the number of employees (Question 7).<sup>18</sup>

*Industry* (DMAN, DTRA, DOTHER).<sup>19</sup> Characteristics specific to a given industry can influence the profitability of ecodesign. For example, if an industry is less competitive as a result of a high concentration of companies, then it is possible, all other things being equal, that each innovation developed in the industry will be more profitable. Questions 5 and 6 asked about the industry in which each company operated. Based on our review of the sample, we decided to divide the companies into three industry categories: manufacturing, trade and services, and other.

*Clientele* (B2B). All other things being equal, companies doing business with other companies (B2B) are more likely to turn a profit on their ecodesign activities than companies catering to the general public (B2C). Company purchasing professionals seem more aware and better equipped than consumers to appreciate ecodesign-related innovations, as our 2008 exploratory study suggested. Question 8 asked about the type of users of the company's products.<sup>20</sup>

*Buyer awareness* (AWARENESS). Similarly, all other things being equal, if the product targets buyers who are more sensitive to environmental issues, then they should be willing to pay more for the product, and company profitability for the product should be higher. Question 32 asked respondents about this topic.<sup>21</sup>

*Origin* (FR, QC).<sup>22</sup> All other things being equal, ecodesign may be more profitable in one geographic area than another for a variety of reasons, such as stricter government regulations that require calls for tenders to include environmental performance assessments in their selection criteria, or greater public awareness of environmental issues.

More detailed information about the variables can be found in the appendix. The econometric model described in this section was estimated by means of an ordered probit, with the dependent variable being an ordered polytomous variable.

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- 18 We created four size categories and assigned them values from 1 to 4 (1: 0 to 10 employees [DT1]; 2: 11 to 50 [DT2]; 3: 51 to 250 [DT3]; 4: 251 or more [DT4]).
  - 19 Three binary (two-state) variables were created. The variable DMAN was set to 1 for manufacturing companies, and otherwise to 0. The variable DTRA was set to 1 for companies in the trade and services industries, and otherwise to 0. The variable DOTHER was the one excluded by default.
  - 20 The variable was given a value of 0 if the answer to Question 8 was B2C, a value of 1 if the answer was B2B, and a value of 2 if the answer was B2B and B2C.
  - 21 The variable was assigned a value from 1 to 3 depending on the respondent's assessment (1: not aware; 2: average awareness; and 3: strong awareness).
  - 22 Three binary (two-state) variables were created. The variable FR was set to 1 for French companies, and otherwise to 0. The variable QC was assigned values in the same fashion. The variable EU (European Union) was the one excluded by default.





# RESULTS

## ▶ 3.1 Descriptive Analysis

In this section we begin by presenting the characteristics of the sample based on analysis of the control variables. Then we examine the variables used to represent profitability and ecodesign practices, distinguishing between the variables for the intensity of the ecodesign approach and those for overall management quality.

Note that we systematically checked for any significant differences between the three regions. Those that we found have been explicitly highlighted.<sup>23</sup>

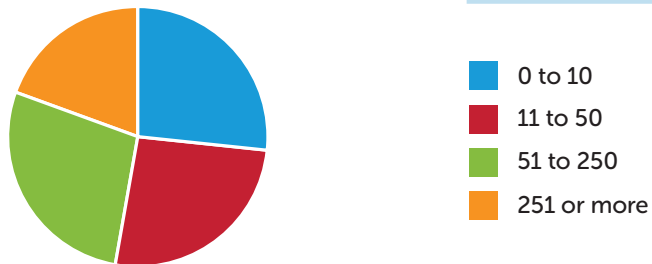
### 3.1.1 Profile of Sample

The sample consisted primarily of very small businesses (VSBs) and small and medium-sized businesses (SMBs): companies with fewer than 250 employees accounted for 80% of the sample. In the European Union (EU), however, companies of this size constituted only 65% of the sample.

▶ **TABLE 1: COMPANY SIZE**

119 companies answered this question

	France (%)	Quebec (%)	European Union (%)	Total (%)	Basque Country (%)
0 to 10	26	34	15	27	10
11 to 50	31	27	15	26	10
51 to 250	29	23	35	28	52
251 or more	14	16	35	19	28
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>



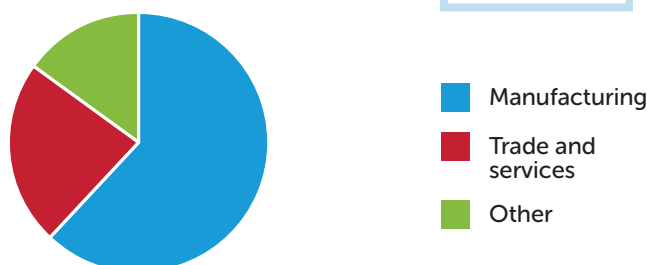
23 Depending on the nature of the variables, we used either Student's t-test or the Chi-squared test.

The breakdown of companies by industry is significantly heterogeneous among the three geographic areas. Over two thirds of companies in France and Quebec are manufacturing businesses, compared with just one third in the European Union.

**TABLE 2: INDUSTRY**

119 companies answered this question

	France (%)	Quebec (%)	European Union (%)	Total (%)	Basque Country (%)
Manufacturing	71	70	35	62	93
Trade and services	25	23	19	23	7
Other	4	7	46	15	0
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>

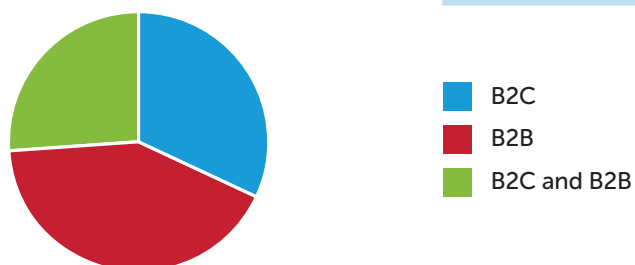


The clientele of the companies in our sample was significantly heterogeneous from one geographic area to another. An especially high percentage of companies in the EU said that they did business with other companies (73%), compared with 30% in France and 35% in Quebec. Close to one third of the companies said that they catered exclusively to consumers (B2C). In this respect, the European Union stands out for its low percentage (12%) of B2C companies. A quarter of the companies said they did business with both consumers and other businesses; in France, the percentage was higher, at 36.7%.

**TABLE 3: CLIENTELE**

118 out of 119 companies answered this question

	France (%)	Quebec (%)	European Union (%)	Total (%)	Basque Country (%)
B2C	33	44	12	32	14
B2B	30	35	73	42	72
B2C and B2B	37	21	15	26	14
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>



Buyers of ecodesigned products are usually quite well aware of environmental issues, with respondents giving them an average awareness score of 2.2 across the three geographic areas (on a scale ranging from a low of 1 to a high of 3).

▶ **TABLE 4 BUYERS' AWARENESS OF ECODESIGNED PRODUCTS**

118 out of 119 companies answered this question

	France	Quebec	European Union	Total
Awareness (on a scale from 1, low, to 3, high)	2.2	2.3	2.2	2.2

### 3.1.2 Ecodesign Profitability

Three questions were asked to measure the impact of the ecodesigned product on profitability. Regardless of the indicator chosen, the impact was positive or neutral in most cases. This indicates that companies can improve their environmental impact without suffering any adverse effects on their profits, in absolute terms, or on their profit margin. The new data confirm two of the main results of the 2008 study.

First result: In 2008, in the vast majority of cases, ecodesign helped maintain or increase company profits. In the 2013 study, the impact of ecodesigned products on company profits was widely deemed to be positive or neutral by companies in France (98%), the European Union (96%), and Quebec (93%). A positive impact was more common in the European Union category (64%) and Quebec (51%).

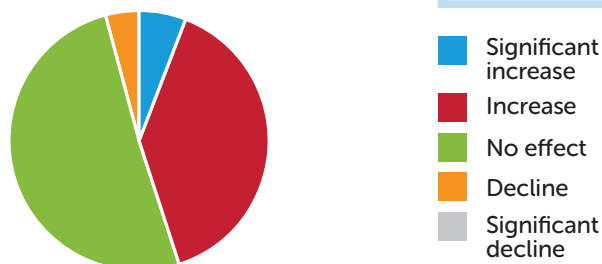
Second result: In 2008, ecodesigned products generated a profit margin at least as great as conventionally designed products. In 2013, the profit margin trend for ecodesigned products, compared with that for conventionally developed products, was positive or neutral for most responding companies in France (96%), the European Union category (92%) and, albeit to a lesser extent, Quebec (70%).

Respondents' answers on the impact of ecodesigned products on company profits were significantly heterogeneous. While close to half of the companies in Quebec and the European Union (excluding France) said the impact was positive, only 29% of French companies did so, with most of them reporting that the impact was neutral.

▶ **TABLE 5: IMPACT OF ECODESIGNED PRODUCTS ON PROFITS**

116 out of 119 companies answered this question

	France (%)	Quebec (%)	European Union (%)	Total (%)	Basque Country (%)
Significant increase	0	5	20	6	8
Increase	29	46	44	39	38
No effect	69	42	32	51	54
Decline	2	7	4	4	0
Significant decline	0	0	0	0	0
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>



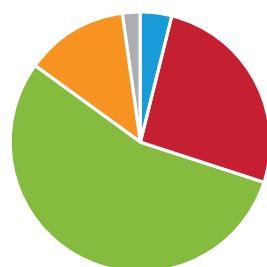
Regarding the change in profit margin compared with a standard product, the answers from the responding companies were significantly heterogeneous. While the margin was similar or positive in 80% of the cases in France, the corresponding percentage was only 60% in Quebec and the European Union category. More specifically, for a clear majority of companies in France, and to a lesser extent those in the European Union, the change in profit margin was similar to that for conventionally developed products. In Quebec, only a third of the responding companies reported that this was the case.

▶ **TABLE 6: CHANGE IN PROFIT MARGIN**

(compared with conventional design)

114 out of 119 companies answered this question

	France (%)	Quebec (%)	European Union (%)	Total (%)	Basque Country (%)
Much higher	2	9	0	4	0
Higher	19	28	38	26	24
Similar	75	32	54	55	72
Lower	4	26	8	13	4
Much lower	0	5	0	2	0
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>



- Much higher
- Higher
- Similar
- Lower
- Much lower

The third question measuring the impact on profitability concerned the profit margin differential between ecodesigned products and conventionally designed ones. The answers from companies in the three geographic areas were very similar: the profit margin per unit was around 12% higher on average for ecodesigned products.

▶ **TABLE 7 PROFIT MARGIN DIFFERENTIAL BETWEEN ECODESIGNED PRODUCT AND CONVENTIONALLY DESIGNED PRODUCT**

119 companies answered this question

	France (%)	Quebec (%)	European Union (%)	Total (%)
Differential	12	12	13	12

### 3.1.3 Ecodesign and Management Practices

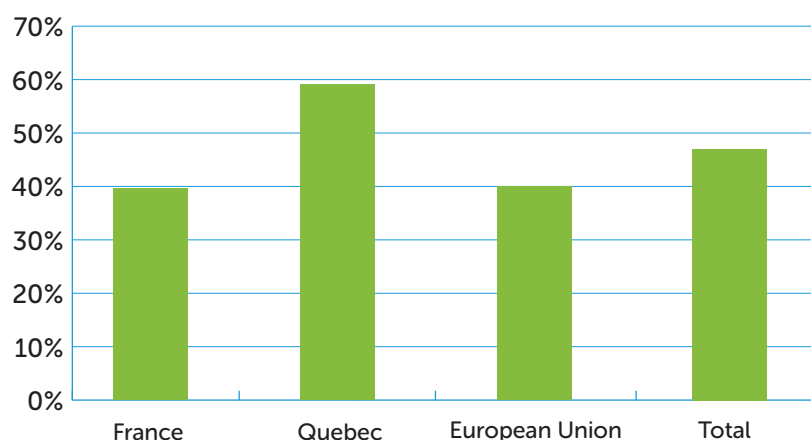
#### (a) Variables Representing Intensity of Ecodesign Approach

Overall, close to half of the companies said they were experienced in ecodesign. Quebec headed the list, with 59% of companies stating they had previous ecodesign experience, compared with 40% in France and the European Union.

▶ **TABLE 8 COMPANIES WITH ECODESIGN EXPERIENCE**

117 out of 119 companies answered this question

	France	Quebec	European Union	Total
	(%)	(%)	(%)	(%)
Ecodesign experience	40	59	40	47




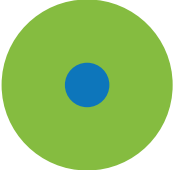

Quebec companies had the longest experience with ecodesign, with 10 years, compared with 5.7 years for companies in the European Union category and 4.5 years for those in France. Similarly, based on the number of projects carried out over the last three years, Quebec again headed the list, with an average of 18 projects, compared with around 6 for companies in the European Union and France. However, on account of the very wide variation in the answers for those two variables within the same region, the differences were not significant. In Quebec, for example, the number of years ranged from 2 to 18, with an average of 10.

▶ **TABLE 9 ECODESIGN EXPERIENCE**

	France	Quebec	European Union	Total
Number of years' experience	4.5	10.1	5.7	7.1
103 out of 119 companies answered this question				
Number of projects in past three years	6.0	18.1	6.7	11.5
95 out of 119 companies answered this question				

The companies were asked about their three primary motivations for taking an ecodesign approach. “Personal convictions of senior executive officer” was the leading motivation stated among ten possible choices. It was the first motivation cited by 65% of the responding companies in the European Union and 80% of those in France, but the differences were not significant. “Search for new markets” was the second most common motivation; it was cited by 22% of the responding companies in the European Union and 29% in France. Finally, the third leading motivation, “market adaptation” (anticipate new regulations, seek out new markets, or seek out savings), was cited by 67% of the responding companies in France and 34% in Quebec.

▶ **TABLE 10 MOTIVATION**

	France (%)	Quebec (%)	European Union (%)	Total (%)	
<p>“Personal convictions of senior executive officer” was selected as the <b>primary reason</b> why the company got involved in ecodesign.</p> <p>114 out of 119 companies answered this question</p>	80	72	65	74	
<p>“Search for new markets” was selected as the <b>second reason</b> why the company got involved in ecodesign.</p> <p>92 out of 119 companies answered this question</p>	29	26	22	26	
<p>“Anticipation of future regulations, search for new markets, or search for savings” was selected as the <b>third reason</b> why the company got involved in ecodesign.</p> <p>82 out of 119 companies answered this question</p>	67	34	48	48	

Close to half of the companies in the sample said that their ecodesigned product selected for the study met the requirements of an environmental standard. The percentage was slightly higher in France (53.4%) than in the European Union category (45.8%) or Quebec (43.2%).

▶ **TABLE 11: ENVIRONMENTAL STANDARD**

111 out of 119 companies answered this question

	France (%)	Quebec (%)	European Union (%)	Total (%)	Basque Country (%)
Environmental standard	53	43	46	48	76

When asked about product life cycle stages, respondents identified an average of 3.9 stages (out of a possible total of 6) that were taken into consideration during the ecodesign process. The answers were quite homogeneous, regardless of region.

▶ **TABLE 12 NUMBER OF LIFE CYCLE STAGES**

119 companies answered this question

	France	Quebec	European Union	Total
Life cycle stages (scale of 1 to 6)	3.9	3.5	3.5	3.7

The stages most commonly cited (by over 50% of respondents in the geographic area) were:

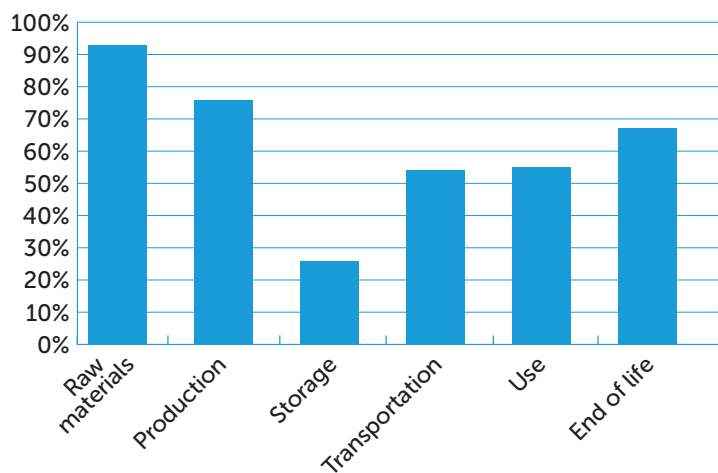
- Raw materials (94% in France, 93% in Quebec, and 92% in the EU)
- Production (94% in France, 61% in Quebec, and 75% in the EU)
- Transportation (55% in France, 51% in Quebec, and 67% in the EU)
- Use (77% in the EU)
- End of life (73% in France, 68% in Quebec, and 61% in the EU)

▶ **TABLE 13 LIFE CYCLE STAGES TAKEN INTO CONSIDERATION IN ECODSIGN**

119 companies answered this question

	France (%)	Quebec (%)	European Union (%)	Total (%)
Raw materials	94	93	92	93
Production	94	61	75	76
Storage	26	25	27	26
Transportation	55	51	67	54
Use	49	50	77	55
End of life	73	68	61	67

Respondents could select multiple choices



Respondents associated an average of 4.9 environmental benefits (out of a possible 14) with their ecodesigned product. The answers were quite homogeneous across the three geographic areas.

▶ **TABLE 14 NUMBER OF ENVIRONMENTAL BENEFITS OF PRODUCT**

119 companies answered this question

	France	Quebec	European Union	Total
Environmental benefits (scale of 1 to 14)	5.3	4.5	4.8	4.9

The benefits most commonly cited (by over 50% of respondents in the geographic area) were:

- Reduction in materials used per unit produced (51% in Quebec and 77% in the EU)
- Replacement of environmentally harmful raw materials or hazardous products (61% in France and 67% in Quebec)
- Reduction in energy required to use product (57% in the EU)
- At end of life, possibility of recycling or reusing product or its components (55% in France and 58% in Quebec)

▶ **TABLE 15 NATURE OF ENVIRONMENTAL BENEFITS OF PRODUCT**

118 out of 119 companies answered this question

	France (%)	Quebec (%)	European Union (%)	Total (%)
Replacement of environmentally harmful raw materials or hazardous products	61	67	31	57
Reduction in materials used per unit produced	47	51	77	55
At end of life, possibility of recycling or reusing product or its components	55	58	39	52
Reduction in energy used per unit produced	39	49	50	45
Reduction in company's CO <sub>2</sub> emissions	43	44	35	42
Reduction in packaging	35	44	42	40
Waste, water or raw materials recycled during production	33	44	27	36
Reduction in soil, water or air pollution during production	35	30	12	28
Reclamation of waste materials	26	30	27	28
Reduction in energy required for transportation	20	30	35	27
Reduction in energy required to use product	14	23	57	27
Reduction in emissions (water, air, soil) during use	20	21	23	21
Reduction in storage space	16	23	23	20
Other	4	14	15	10

Respondents could select multiple choices



A very clear majority of the respondents said they used a tool in their ecodesign process. However, the percentage of positive answers varied significantly with the geographic area, from 85.4% in France to 65.9% in Quebec.

**▶ TABLE 16 USE OF TOOLS IN ECODESIGN PROCESS**

116 out of 119 companies answered this question

	<b>France</b>	<b>Quebec</b>	<b>European Union</b>	<b>Total</b>
	(%)	(%)	(%)	(%)
Tools used in ecodesign	85	66	75	76

Examples of tools: life cycle analysis, life cycle thinking, checklist

In each company, an average of 3.14 functions (out of a possible 6) were involved in the ecodesign process. The answers were very similar across the three geographic areas.

**▶ TABLE 17 NUMBER OF FUNCTIONS INVOLVED IN ECODESIGN PROCESS**

119 companies answered this question

	<b>France</b>	<b>Quebec</b>	<b>European Union</b>	<b>Total</b>
Number of functions involved (scale of 1 to 6)	3.2	3.1	3.1	3.1

The three functions most commonly cited (in over 50% of answers) were:

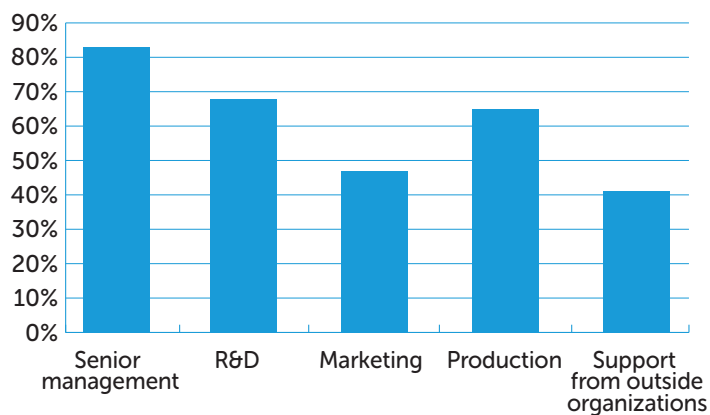
- Senior management (90% in France, 87% in Quebec, and 61% in the EU)
- R&D (67% in France, 61% in Quebec, and 81% in the EU)
- Production (79% in France, 52% in Quebec, and 61% in the EU)

▶ **TABLE 18 FUNCTIONS INVOLVED IN ECODESIGN APPROACH**

118 out of 119 companies answered this question

	France (%)	Quebec (%)	European Union (%)	Total (%)
Senior management	90	87	61	83
R&D	67	61	81	68
Marketing	42	50	50	47
Production	79	52	61	65
Support from outside organizations	50	25	50	41

Respondents could select multiple choices

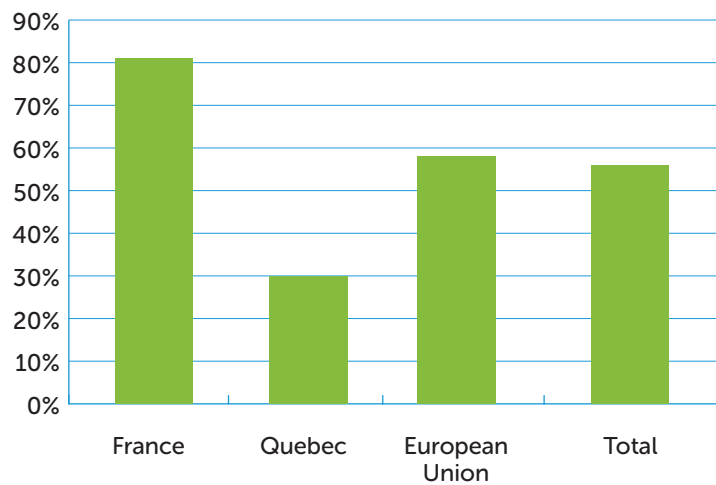


The answers regarding ecodesign project support received from professional organizations were fairly and significantly heterogeneous, depending on the geographic area: only 29% of the responding companies in Quebec benefited from support, compared with 59% in the European Union category and 81% in France.

▶ **TABLE 19: SUPPORT FROM PUBLIC OR PROFESSIONAL ORGANIZATIONS FOR ECODESIGN PROJECT**

117 out of 119 companies answered this question

	France (%)	Quebec (%)	European Union (%)	Total (%)	Basque Country (%)
Support from organizations	81	30	58	56	74



The communication strategies reported by the respondents were very homogeneous across the three areas, with 91% of them saying they promoted the environmental qualities of their ecodesigned products.

▶ **TABLE 20 PROMOTION OF ENVIRONMENTAL QUALITIES OF ECODESIGN PRODUCT**

117 out of 119 companies answered this question

	France (%)	Quebec (%)	European Union (%)	Total (%)
Promotion of environmental qualities	92	90	92	91

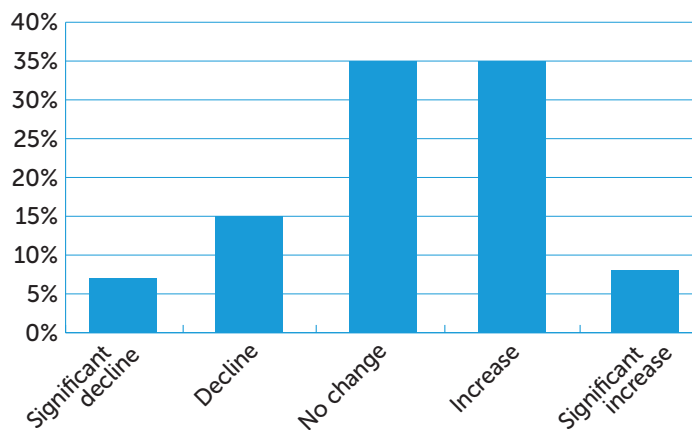
## (b) Variables Representing Quality of Company Management

The net profit of the responding companies rose over the last three years, in all three areas, with 43% of respondents saying they had seen an increase or significant increase. Differences by region were not very significant. While net profit increased or increased significantly for 52% of European Union companies, it did so for only 33% of French companies.

▶ **TABLE 21 CHANGE IN PROFITS OVER LAST THREE YEARS (I)**

115 out of 119 companies answered this question

	France (%)	Quebec (%)	European Union (%)	Total (%)
Significant decline	2	9	12	7
Decline	11	19	20	15
No change	54	24	16	35
Increase	29	36	44	35
Significant increase	4	12	8	8
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>



The change in profits was homogeneous across the three geographic areas, being rated at 3.2 on a scale of 1 to 5.

▶ **TABLE 22 CHANGE IN PROFITS OVER LAST THREE YEARS (II)**

115 out of 119 companies answered this question

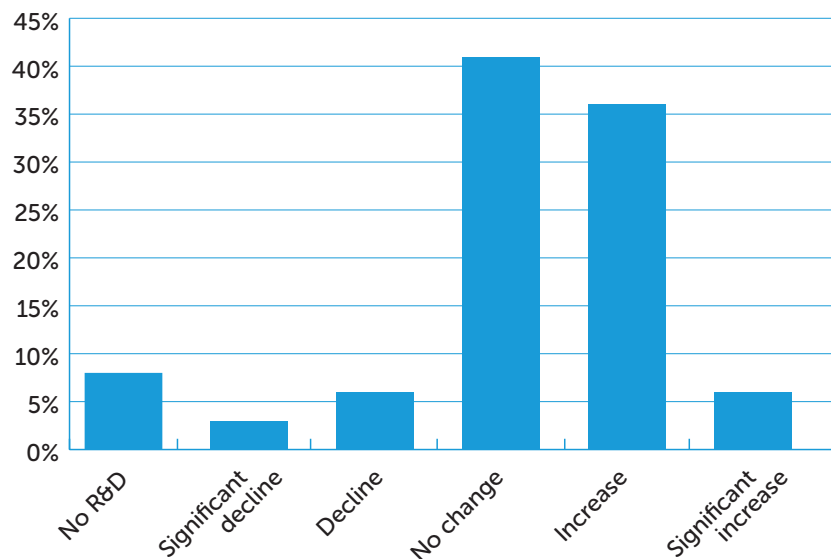
	France	Quebec	European Union	Total
Change in profit index (scale of 1 to 5)	3.2	3.2	3.2	3.2

Most of the companies carried out R&D. In the three geographic areas, close to 40% of respondents said that R&D spending had remained stable in recent years, while 42% said it had increased.

▶ **TABLE 23 CHANGE IN R&D SPENDING OVER LAST THREE YEARS**

116 out of 119 companies answered this question

	France (%)	Quebec (%)	European Union (%)	Total (%)
No R&D	13	7	0	8
Significant decline	2	2	4	3
Decline	4	9	4	6
No change	46	40	32	41
Increase	31	37	48	36
Significant increase	4	5	12	6
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>



The average number of a product’s functional aspects influenced by ecodesign was quite similar across the three geographic areas. It was still relatively low, however, in relation to the number of possible answers (scale of 1 to 7).

**▶ TABLE 24 FUNCTIONAL ASPECTS INFLUENCED BY ECODESIGN**

118 out of 119 companies answered this question

	France	Quebec	European Union	Total
Average number of functional aspects (scale of 1 to 7)	2.3	1.8	1.6	2

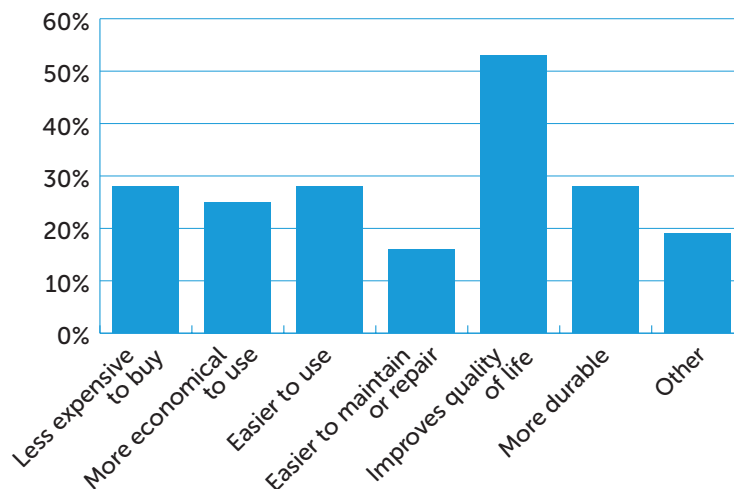
Responses about product functionality were fairly heterogeneous. Overall, “improves quality of life” was the functionality cited by the majority of respondents, with a very high percentage of French respondents mentioning it (67%).

**▶ TABLE 25: ADVANTAGES OF ECODESIGNED PRODUCT FOR END USER**

118 out of 119 companies answered this question

	France (%)	Quebec (%)	European Union (%)	Total (%)	Basque Country (%)
Less expensive to buy	24	36	23	28	12
More economical to use	15	18	54	25	31
Easier to use	41	18	19	28	6
Easier to maintain or repair	13	14	23	16	12
Improves quality of life	67	43	46	53	21
More durable	20	39	23	28	10
Other	11	30	15	19	0

Respondents could select multiple choices

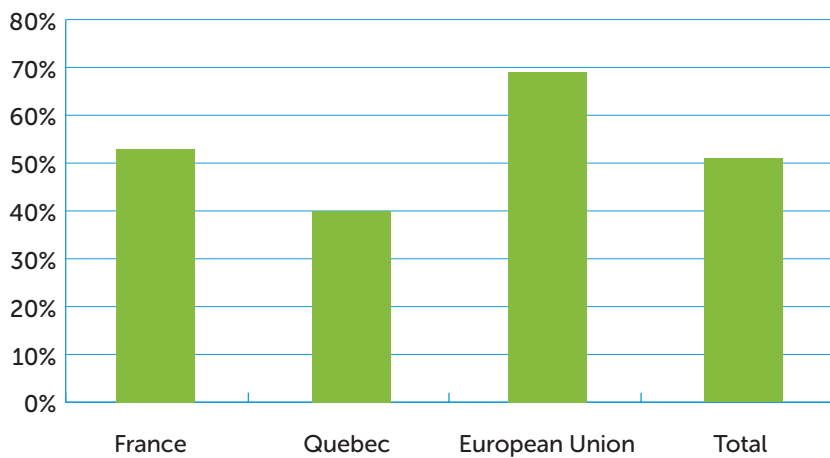


Answers regarding recognition earned by the company for the quality of its management or products were significantly heterogeneous. While a very clear majority of European Union companies (69%) said they had obtained certification, only 40% of Quebec respondents said they had.

**▶ TABLE 26 RECOGNITION RECEIVED IN LAST THREE YEARS**

112 out of 119 companies answered this question

	France	Quebec	European Union	Total
	(%)	(%)	(%)	(%)
Recognition (certification)	53	40	69	51



Senior management's level of commitment to sustainable development was rated quite high (an average of 3.4 on a scale from 1 to 5) by the responding companies across the three geographic areas.

**▶ TABLE 27 LEVEL OF COMMITMENT OF SENIOR MANAGEMENT TO SUSTAINABLE DEVELOPMENT**

115 out of 119 companies answered this question

	France	Quebec	European Union	Total
Commitment to sustainable development (scale of 1 to 5)	3.4	3.6	3	3.4

### (c) Other Variables

Two variables helpful in understanding ecodesign practices, but that were not used in the statistical model are the following: (1) forms of assistance companies would like to have, and (2) positive impacts other than financial. Answers about the types of assistance companies would like to have from outside organizations for their ecodesign initiatives varied geographically.

The types of assistance most often cited (by over 40% of respondents) were:

- Assistance for environmental analysis (44% in Quebec and 58% in the EU)
- Financial assistance (41% in France, 51% in Quebec, and 81% in the EU)
- Assistance for product environmental certification (41% in France and 50% in the EU)
- Assistance for product marketing (42% in Quebec and 46% in the EU)
- Information on future regulations (46% in the EU)
- Information on green materials and their application (42% in the EU)

▶ **TABLE 28 TYPES OF ECODESIGN ASSISTANCE COMPANIES WOULD LIKE TO HAVE FROM OUTSIDE ORGANIZATIONS**

105 out of 119 companies answered this question

	France	Quebec	European Union	Total
	(%)	(%)	(%)	(%)
Financial assistance	41	51	81	55
Assistance for environmental analysis	24	44	58	41
Assistance for product environmental certification	41	35	50	41
Assistance for product marketing	16	42	46	34
Information on future regulations	24	30	46	32
Information on green materials and their application	24	30	42	31
Information on green materials suppliers	27	30	35	30
Assistance for studying new markets	22	37	23	28
Assistance for explaining approach to customers	19	26	19	22
Information on existing regulations	14	5	31	14
Product design assistance	8	16	19	14
Assistance for explaining advantages of ecodesign within company	3	7	8	6
Other	5	7	0	5

Respondents could select multiple choices



When asked about the benefits of ecodesign other than financial, the vast majority of companies mentioned “improved recognition and reputation” (average of 86% across the three areas). “Greater employee motivation or pride” was considered to be another major benefit of ecodesign (by 58% of respondents in the EU and 53% in Quebec).

**TABLE 29 OTHER POSITIVE IMPACTS OF ECODESIGN APPROACH**

117 out of 119 companies answered this question

	France (%)	Quebec (%)	European Union (%)	Total (%)
Improved recognition and reputation	92	84	81	86
Greater employee motivation or pride	21	53	58	41
Better customer relations	33	47	23	36
Greater capacity to develop new products	29	33	35	32
Easier to recruit staff	4	23	19	15
Improved relations with funding agencies, regulatory authorities, or NGOs	8	12	19	12
Better interdepartmental cooperation	17	2	19	12
Other	4	9	4	6

Respondents could select multiple choices

## 3.2 Results of Empirical Model

### 3.2.1 Methodology and Analysis of Robustness of Model

The goal of this study was to estimate the impact of the intensity of the ecodesign approach and overall management quality on the economic profitability of ecodesign in the firms in our sample, while controlling for the firms’ intrinsic characteristics.

It should be noted that we made several estimates using different methods to measure profitability, ecodesign experience, company size, motivation, and number of industry categories. The model we finally chose, set out in Table 30, was the one that offered the greatest convergence or explanatory power.<sup>24</sup>

<sup>24</sup> In addition to estimates from the ordered probit model, we calculated the marginal effects of the independent (or explanatory) variables on the variation in profitability associated with ecodesign, for the three possible states of the dependent variable PROFITABILITY, corresponding to (1) a drop, (2) no change, or (3) an increase in the profitability associated with ecodesign activities. These coefficients are to be interpreted as follows: positive coefficients help explain how any increase in the independent variable X will increase the probability of the highest state, whereas conversely, negative coefficients indicate that an increase in X will increase the likelihood of the lowest state. The complete results are available on request.

In all these estimate attempts, we faced two measurement problems:

- The first concerned the low convergence of the models that included variables for measuring the raw profitability of ecodesign. To counter this weakness, we attempted to estimate the same type of model using alternative variables, measuring ecodesign profitability directly. The excessive dispersion of the answers to questions 41 and 42 (and their sum) diminished the explanatory power of the model. Although the estimates resulting from the use of these dependent variables were convergent, the coefficients did not seem sufficiently significant to us.
- The second issue was how to measure non-responses. Our initial sample consisted of 119 firms; however, the estimate from the ordered probit model was based on only 69 observations, as several of the variables used included a certain number of non-responses. In other words, several respondents did not provide us with a fully completed questionnaire. In the next stages of our analyses, we intend to use a number of different techniques to address this problem of missing data.

Despite these issues, the results presented here are reliable and robust, that is, the explanatory power of the model is strong enough to allow us to deduce the initial statistical interpretations about the relationship we wanted to test. The model explains 28% of the studied phenomenon, which is quite satisfactory for this kind of study.

### 3.2.2 Discussion and Main Contributions

The estimate results given in Table 30 show that the variables measuring the intensity of ecodesign practices were, on the whole, more significant than those assessing the overall quality of company management. Note that we used 11 variables to measure the intensity of ecodesign practices in different ways (see Section 2 – Methodology).

A first set of explanatory variables—life cycle stages and methodological tools—have a significant, positive impact on profit growth, while the variables used to measure the motivations behind an ecodesign initiative are significant and negative. This shows that the more global, structured, and systematic the ecodesign approach, the higher the probability that financial performance will improve.

More specifically, the variable CYCLE, which represents the number of product life cycle stages taken into consideration in the ecodesign process, has a very significant positive coefficient. This observation indicates that the greater the number of stages considered in the process, the higher the probability that ecodesign will be profitable. This result confirms the trends we observed in 2008. Similarly, the use of a formal methodological tool (variable METHODOLOGY) seems to have a significant positive impact on the dependent variable.

A second set of explanatory variables was used to measure the overall quality of the management of the firms in the sample. Two of the four variables in this set—FUNCTIONALITY and RECOGNITION (which measure, respectively, the functional quality of the ecodesigned product and the quality of company management based on certifications or awards received)—have a significant positive impact.

Developing products that are both greener and more practical seems to be a winning combination. This also confirms the trends observed in our 2008 study. The impact of the variable RECOGNITION suggests that outside recognition helps companies to achieve better market penetration for their ecodesigned products.

A third set of variables (control variables) measured the impact of the intrinsic characteristics of the firms in our sample on the profitability of the ecodesigned products. Of the 12 variables in this vector, DT1, representing very small companies, and QC, for Quebec companies, are significant.

Consequently, the smaller a company in our sample, the greater the impact of the ecodesigned product on the variation in profitability. This observation would appear to suggest, among other things, that small businesses, being more dynamic and flexible than larger ones, are better able to seize ecodesign-related business opportunities.

In addition, being a Quebec company involved in ecodesign has a significant negative impact on variation in profitability when compared with the other two geographic areas, which confirms a trend observed in 2008. Based on the descriptive analysis of the data collected for this study, it would appear that at least four factors can explain this finding: (1) Quebec-based companies use proportionately fewer formal methodological tools than companies in France or the rest of the EU; (2) they also received less outside support for their ecodesign initiatives; (3) the overall quality of their management, as reflected by outside recognition in the form of certification and awards, would appear to be lower; and (4) they have more experience in ecodesign, suggesting that the best business opportunities for profiting from ecodesign may have already been seized.

Finally, the remaining significant variables tend to have a negative impact: the first two reasons cited by firms in our sample for taking an ecodesign approach (MOTIVATION1 and MOTIVATION2) and senior management's level of commitment to sustainable development (COMMITMENT SD).

Whereas the first (MOTIVATION1) and third (COMMITMENT SD) variables include a measurement internal to the firm, i.e., the motivation of the senior executive officer, the second (MOTIVATION2) takes into account an outside constraint, i.e., new market opportunities. Interpreting these variables' negative coefficients is somewhat tricky, as this trend reflects neither reality nor the results of previous empirical studies. We believe these variables' negative coefficients may be due to a measurement bias. For example, it is possible that the variable representing senior managers' personal convictions in favor of ecodesign (MOTIVATION1) captures an unobservable factor, such as lack of experience of senior management, which itself is negatively related to profitability. The negative sign for the variable COMMITMENT SD may also be due to the same phenomenon.

As for the variable MOTIVATION2, the negative sign suggests that companies that implement ecodesign in order to penetrate new markets may be less successful than those that do so with a view to reducing costs, for example. These variables need to be investigated further.

▶ TABLE 30 RESULTS OF ESTIMATES FROM ORDERED PROBIT MODEL

Variables	Positive (+) or negative (-) influence of variable on profitability	Level of reliability of result	
		*** Very significant (1% margin of error) ** Significant (5% margin of error) * Significant (10% margin of error) / No impact detected	
<b>Variables representing intensity of ecodesign approach</b>	EXPERIENCE	-	/
	MOTIVATION1	-	***
	MOTIVATION2	-	**
	MOTIVATION3	+	/
	CERTIFICATION	-	/
	CYCLE	+	***
	BENEFITS	-	/
	METHODOLOGY	+	**
	INTEGRATION	+	/
	SUPPORT	-	/
COMMUNICATION	+	/	
<b>Variables representing quality of management</b>	R&D	+	/
	FUNCTIONALITY	+	**
	RECOGNITION	+	**
	COMMITMENT SD	-	*
<b>Control variable</b>	DT1	+	***
	DT2	+	/
	DT3	+	/
	DT4	Reference size	
	DMAN	+	/
	DTRA	+	/
	DOTHER	Reference industry	
	B2B	+	/
	AWARENESS	-	/
	FR	-	/
	QC	-	***
	EU	Reference geographic area	
Number of observations		69	
<b>Pseudo R<sup>2</sup></b> (explanatory power)		<b>27.8%</b>	

# CONCLUSION

The main objective of this study was to identify the determinants of ecodesign profitability, five years after an initial study on the same topic was conducted with 30 companies in France and Quebec (Berneman et al., 2008). The 2008 study quite clearly suggested that companies could profit from implementing an ecodesign approach. As the first survey was only exploratory, however, we thought that this new study should (1) examine how the situation has changed since 2008, (2) broaden the sample size to obtain more statistically robust and therefore more generalizable results, and (3) expand our investigation to try to understand why one ecodesign approach is more profitable than another.

With these goals in mind, we performed statistical analysis on data gathered in a new survey. The survey was conducted by means of a 48-item questionnaire that company respondents could complete online or that we could fill in with them over the phone. Around 750 companies were contacted and in the end, data were collected from 119 of them: 49 in France, 26 in other European Union countries, and 44 in Quebec. Despite our efforts, only one Canadian company outside Quebec completed the questionnaire. As the company also operates in Quebec, we decided to include it with the other Quebec companies. To our knowledge, the data derived from the survey constitute the largest database available on ecodesign and related profitability.

In the first, purely descriptive stage of our statistical analysis, we presented the highlights of the answers to the questionnaire. With the descriptive data, we were able to draw up a profile of the typical ecodesign company and learn more about the profitability of the ecodesign approach.

In the second stage of the study, we sought to identify the factors that determine the degree of profitability of ecodesign. Our working hypothesis was as follows: the more intense the ecodesign approach and the better the overall management of the company, the more profitable ecodesign will be. To test the hypothesis, we used an ordered probit regression model where the phenomenon to be explained (the dependent variable) is a measure of ecodesign profitability, and the explanatory factors (the independent variables) are the intensity of the ecodesign approach, the overall quality of company management, and certain intrinsic characteristics (control variables).

Before presenting the main findings, we should point out the limits of our analysis once again. First, our sample is not entirely random: our Quebec researchers had to rely on their contacts to collect enough data for meaningful statistical analysis. This may have skewed the sample in favor of more experienced, more successful companies with higher profiles. Second, many respondents did not complete the entire questionnaire, thus reducing the size of our sample for the regression analysis. Third, at this stage, some of our results are counter-intuitive and so we need to expand our investigation and conduct more in-depth analyses to properly understand them. As this research project is the first of its kind (to our knowledge), there is little existing literature to refer to for comparison purposes.

## ▶ MAIN FINDINGS

- The ecodesign approach seems much more widely used now than it was in 2008. We were able to obtain ecodesign data from more than 90 companies in France and Quebec, whereas in 2008, we had trouble finding 30 companies to make up our sample. On average, the companies in our sample had seven years of experience working with ecodesign.

### Profile of Companies That Take an Ecodesign Approach

- Most of the companies that practice ecodesign are in **manufacturing**; they made up 62% of our sample.
- The companies that have adopted ecodesign are profitable, innovative **small businesses**, recognized for the quality of their management, that cater to other businesses (B2B) or to consumers (B2C), or else to both.
  - More than 80% of the companies in our sample had fewer than 250 employees. More than 75% of them recorded stable or rising profits over the last three years. During the same period, over 80% of them had stable or increasing R&D spending, and more than half had won an award or earned certification for the quality of their management or products. Finally, 32% were B2C companies, 42% were B2B, and 26.3% operated in both markets.
- A large proportion of the responding companies base their practices on an **environmental standard** and use a formal **methodological tool** in their ecodesign approach.
  - Close to 50% of the responding companies said that their ecodesigned product met an environmental standard. Over 75% said they used a methodological tool.
- The responding companies try to reduce the environmental impact at several different **stages of the product life cycle**, which has a number of environmental benefits.
  - An average of four stages of the product life cycle (out of a possible six) are taken into consideration in the ecodesign process. The three most frequently cited stages are raw materials (93%), production (76%) and end of life (67%). Each ecodesigned product thus has an average of five environmental advantages (out of a possible 14) over a comparable conventionally designed product. The most commonly cited advantages were the replacement of environmentally harmful raw materials with more environmentally friendly ones (57%); the reduction of raw materials used per unit produced (55%); the possibility of recycling or reusing the product or its components, at the end-of-life stage (52%); the reduction in energy used per unit produced (45%) and the attendant reduction in CO<sub>2</sub> emissions (42%).
- During the ecodesign process, many companies also managed to improve **functional aspects** of their product.
  - On average, the responding companies identified two additional functional advantages (out of a possible seven). The four most often cited advantages were the following: helps to improve quality of life (53%); less expensive to buy (28%); easier to use (28%); and more durable (28%).
- The primary **motivation** to undertake an ecodesign approach stems from the personal convictions of the company's senior executive officer, who is quite committed to sustainable development.
  - Approximately 75% of respondents said that the impetus to switch to an ecodesign approach came from the company's chief executive, whose commitment to sustainable development was assessed at 3.4 on a scale of 5.

- Once launched, an ecodesign approach is developed in **cooperation** with several different functions within the company.
  - Ecodesign projects typically involve resources from an average of three functions within the company. The functions most frequently cited by respondents were senior management (98%), R&D (80%), and production (65%).
- A large proportion of the responding companies sought **outside support** (professional or financial) to develop their ecodesign project.
  - This proportion was 55%, on average, but only 30% in Quebec.
- Most companies say they would like **more assistance** from government to pursue their ecodesign activities.
  - The five most commonly cited forms of support desired were financial assistance (55%), support for environmental certification (41%), environmental analysis advice (41%), marketing advice (34%), and information on future regulations (32%).
- Ecodesign companies feel it is worthwhile **publicizing the environmental benefits** of their ecodesigned products because they consider their buyers to be well aware of environmental issues.
  - More than 90% of respondents said they promote the environmental benefits of their products and rate their buyers' environmental awareness at 2.2 on a scale of 3.

## Results Regarding Profitability of Ecodesign and its Determinants

- While environmental protection is generally considered to be incompatible with a company's profitability, this is not the case with ecodesign. For 96% of the responding companies, ecodesign has a neutral or positive effect on the bottom line, in absolute terms. **From a social standpoint, ecodesign is a win-win solution, as it generates environmental benefits for all, without any negative impact on profitability.** This confirms our 2008 results, but this time our sample was larger and more representative.
  - Ecodesign helped close to 45% of the surveyed companies to increase their profits in absolute terms, while for 51% of companies the impact on profits was neutral.
- The **profit margin** of ecodesigned products compares favorably with that of conventionally developed products.
  - In 85% of cases, the profit margin of ecodesigned products is similar to (54.4% of cases) or higher than (30.3%) that of conventionally developed products.
  - The profit margin of ecodesigned products is **12% higher**, on average, than that of conventional products.
- The vast majority of responding companies said that the ecodesign approach also had **positive, non-financial impacts**.
  - The four most frequently cited positive impacts were improved recognition or reputation (86%), greater employee motivation or pride (41%), better customer relations (36%), and greater capacity to develop new products (32%).
- Some variables representing the **intensity of the ecodesign approach** are associated with greater profitability. For instance, the more the **number of product life cycle stages** the company takes into consideration in its ecodesign approach, the greater the profitability. Similarly, the more methodical the ecodesign process, such as applying a formal **methodological tool**, the higher the profitability.

- Some indicators of **the overall quality of company management** are also associated with greater profitability. For example, a company that receives **outside recognition** of the quality of its management is more likely to be successful in making its ecodesign approach profitable.
- Our survey results also suggest that the greener and more **functional** a company's products, compared with conventional products, the more profitable its ecodesign approach will be.
- The smaller the company, the greater its chances of turning a profit on its ecodesign activities. All things being equal, Quebec companies appear to have been less successful than companies elsewhere in making their ecodesign initiatives profitable.

## ▶ IMPLICATIONS

These results have a number of implications, some of which are more relevant for business executives, others for policymakers who are in a position to promote ecodesign.

### Implications for Business Managers

- Ecodesign is a promising strategy for improving a company's profitability. But the positive impact is more than just financial—the ecodesign approach can become a competitive advantage.
- To launch an ecodesign initiative, it is crucial for the company's senior executive officer to be convinced of its benefits and to send a clear signal to this effect throughout the organization.
- The ecodesign approach is more likely to be successful if it involves several functions within the company, especially senior management, R&D, and production.
- Ecodesign should be done methodically, using a formal methodological tool.
- Ecodesign should be done in a systematic manner and take several stages of the product life cycle into consideration.
- By winning an award or earning certification for the quality of its products or its management, a company can send a positive signal that helps to open up the market for ecodesigned products.
- If the ecodesign approach also leads to improvements in a product's functional qualities, it is more likely to be profitable.



## Implications for Policymakers

Since the ecodesign approach is beneficial for the environment, but has no adverse effects on the economy, **it is clearly worth promoting.**

A number of measures could be implemented to encourage its adoption:

- Set up **ecodesign awareness and training programs**, or provide better support for existing programs. In light of the results of this study:
  - Efforts to promote ecodesign should target small business leaders.
  - To respond to the requests of the companies surveyed, training programs should focus on current and future regulations, environmental analysis, green product marketing, and environmental certification.
  - More effort should be put into promoting ecodesign in the primary and tertiary sectors of the economy, given that it already has a solid foothold in manufacturing.
- Adopt stricter environmental criteria for government procurement of goods and services.
- Further develop extended producer responsibility programs.

These recommendations need to be acted upon more urgently in Quebec, where there seems to be less ecodesign assistance available than in Europe.

# APPENDIX

## ▶ List of Variables

Variable	Type	Definition
<b>EXPLAINED VARIABLE: PROFITABILITY</b>		
Profitability	Ordered from 1 to 3	Intensity of the contribution of ecodesign to the increase in company profits. This variable equals 1 if the sum of variables 41 and 42 is negative, 2 if the sum is zero, and 3 if the sum is positive
<b>EXPLANATORY VARIABLES: INTENSITY, QUALITY</b>		
Intensity1: Experience	Quantitative	Number of years of experience and number of ecodesign projects (sum of questions 16 and 17)
Intensity2: Motivation1	Binary 0 or 1 (yes=1)	Primary motivation is the impetus given by senior management (Question 19=f)
Intensity3: Motivation2	Binary 0 or 1 (yes=1)	Second motivation is the search for new markets (Question 20=j)
Intensity4: Motivation3	Binary 0 or 1 (yes=1)	Third motivation is the anticipation of future regulations, the search for new markets, or the search for savings (Question 21=b, j, or k)
Intensity5: Certification	Binary 0 or 1 (yes=1)	Environmental standard, regulation, or labeling (Question 25)
Intensity6: Cycle	Ordered from 1 to 7	Sum of items, where items are number of life cycle stages used (Question 27)
Intensity7: Benefits	Ordered from 1 to 14	Sum of items, where items are number of environmental benefits stated by respondents (Question 31)
Intensity8: Methodology	Binary 0 or 1 (yes=1)	Use of a methodological tool (Question 28)
Intensity9: Integration	Ordered from 1 to 6	Sum of items, where items are number of functions involved (Question 35)
Intensity10: Support	Binary 0 or 1 (yes=1)	Company received support from outside organizations (Question 36)
Intensity11: Communication	Binary 0 or 1 (yes=1)	Environmental quality of product highlighted in communications (Question 33)

Variable	Type	Definition
<b>EXPLANATORY VARIABLES: INTENSITY, QUALITY (Cont'd)</b>		
Quality1: R&D	Ordered from 0 to 5	Change in company's R&D spending over last few years, ranging from 0 (no spending) to 5 (significant increase in spending) (Question 12)
Quality2: Functionality	Ordered from 1 to 6	Sum of items, where items are number of functional qualities stated (Question 34)
Quality3: Recognition	Binary 0 or 1 (yes=1)	Certification or award for quality of management (Question 13)
Quality4: Commitment SD	Ordered from 0 to 5	Level of senior management's commitment to sustainable development, ranging from 0 (insignificant) to 5 (very significant) (Question 23)
<b>CONTROL VARIABLES: SIZE, INDUSTRY</b>		
Size	4 binary variables	DT1=1 for firms with 0 to 10 employees; DT2=1 for firms with 11 to 50 employees; DT3=1 for firms with 51 to 250 employees; DT4=1 for firms with over 250 employees (Question 7). DT4 is the reference variable
Industry	3 binary variables	DMAN=1 for firms in manufacturing; DTRA=1 for firms in trade and services; DOTHER=1 for firms in agricultural or construction industries (reference variable) (questions 4 and 5)
B2B	Ordered from 0 to 2	Main users of product: B2B=0 if main users are general public; B2B=1 if main users are companies; B2B=2 if the main users are both general public and companies (Question 8)
Awareness	Ordered from 1 to 3	Final buyers' awareness of environmental issues, according to respondents: AWARENESS=1 if no awareness; =2 if average awareness; and =3 if strong awareness (Question 32)
Origin	3 binary variables	FR=1 if firm based in France; QC=1 if based in Quebec; and EU=1 if based in non-France European Union (reference variable)

# BIBLIOGRAPHY

- Ambec, S.; Cohen, M.; Elgie, S.; Lanoie, P. (2013) "The Porter Hypothesis at 20: Can Environmental Regulation Enhance Innovation and Competitiveness?" *Review of Environmental Economics and Policy*, Vol. 7, No. 1, p. 2–22.
- Ambec, S.; Lanoie, P. (2008) "Does it Pay to be Green? A Systematic Overview," *Academy of Management Perspectives*, Vol. 22, No. 4, p. 45–62.
- Berneman, C.; Lanoie, P.; Plouffe, S.; Vernier, M.-F. (2008) *L'écoconception : quels retours économiques pour l'entreprise?* Institut de développement de produits. Montreal.
- Bogliacino, F; Pianta, M. (2013) "Profits, R&D and Innovation – A Model and a Test," *Industrial and Corporate Change*, Vol. 22, No. 3, p. 649–678.
- Doonan, J.; Lanoie, P.; Laplante, B. (2005) "Determinants of Environmental Performance of Canadian Pulp and Paper Plants: An Assessment from Inside the Industry," *Ecological Economics*, Vol. 55, p. 73–84.
- Gourieroux, C. (1989) *Econométrie des variables qualitatives*, Economica.
- Jackson, D. (1998) *Technological Change, the Learning Curve and Profitability*, Edward Elgar Publishing, 240 p.
- Kok, N.; Kahn, M.E. (2012) *The Value of Green Labels in the California Housing Market*, Mimeo, UCLA.
- Lanoie, P.; Plouffe, S.; Vernier, M.F. (2013) *Les retours économiques de l'écoconception : une relance*, Mimeo, HEC Montréal.
- Lindahl, M. (2001), "Environmental Effect Analysis – How Does the Method Stand in Relation to Lessons Learned from the Use of Other Design for Environment Methods," *Proceedings Ecodesign 2001: Second International Symposium on Environmentally Conscious Design and Inverse Manufacturing*, Tokyo, Japan, 11–15 December 2001, p. 864–869.
- Porter, M.; van der Linde, C. (1995) "Toward a New Conception of the Environment-Competitiveness Relationship," *Journal of Economic Perspectives*, 9(4), p. 97–118.
- Reynaud, E. (2003) "Développement durable et entreprise : vers une relation symbiotique," *Journée AIMS, Atelier Développement durable*, ESSCA Angers.
- Russo, M.V.; Fouts, P.A. (1997) "A Resource-based Perspective on Corporate Environmental Performance and Profitability," *Academy of Management Journal*, 40, p. 534–559.



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With the financial support of

