

ECODESIGN STRATEGIES AND THE PRODUCT DEVELOPMENT PROCESS WITHIN NORTHEAST SME BRAZILIAN COMPANIES

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Abstract

This research work is part of the “Institute Fabric of Millennium – IFM”, a national project which aims to support the product development process within Brazilian companies and financially supported by CNPq. The research aims to identify the use of Ecodesign Strategies within Brazilian Small and Medium Enterprises (SMEs) and their external and internal drivers.

In order to achieve these goals a research methodology approach was set. The initial stage of the research methodology was based upon an extensive literature survey. Then, a questionnaire was developed aiming to identify whether Brazilian SME companies are taking into account environmental aspects during their product development process. The questionnaire was used to support a series of visits and interviews with designers and people responsible for the product design within 36 SMEs located at the Northeast region of Brazil.

This work has shown that legislation and government regulations were the main external drivers for companies to adopt Ecodesign strategies within their product development while cost reduction was considered to be the main internal driver. The main roadblocks for implementing Ecodesign are the lack of demand for environmental friendly products and lack of available technical possibilities on Ecodesign. Companies have also indicated that the development of “green” products will bring commercial drawbacks to companies.

Keywords: Ecodesign practices, northeast brazilian SME, product development, external and internal drivers, roadblocks.

1 Introduction

This research work is part of the “Institute Fabric of Millennium – IFM”, a national scientific project which aims to support the product development process within Brazilian companies and financially supported by CNPq (National Research Foundation). Previous studies based on this project have already been published elsewhere [2]. The research aims to identify the use of Ecodesign Strategies within Brazilian Small and Medium Enterprises (SMEs) and their external and internal drivers and it is based on analysis of 36 SMEs located at the Northeast region of Brazil.

Since the last decade, environmental concerns and fierce competition have become to be key aspects to companies within globalized markets, especially to SMEs. Most of the Brazilian SME companies are considered to be “family business” and currently employ a total of 60 million people. They are 4.5 million small businesses, accounting for 98% of industrial, commercial, and service undertakings, more than 60% of urban jobs, and around 21% of the GDP as well as being responsible for 12,4% of all exports on a direct way [6].

2 Research Aims

This research work is based on a group of visits within 36 SME Brazilian companies located at the Northeast of Brazil. Interviews were carried out with professional designers or those who were responsible for the product development in those companies. Basically, the research intends to:

- Present which Ecodesign strategies are most used within these companies;
- Identify the relationship between these strategies and their possible External and Internal drivers, and;
- Identify the main “roadblocks” for companies to incorporate environmental aspects into their product development.

It is believed that the analysis of these aspects will bring new insights for designers on how the development of “environmental friendly products” can be carried out within SME companies.

3. Literature Review

Ecodesign is regarded as a “systematic integration of environmental considerations into product and process design” [4]. As environmental issues have become more important for competitiveness and Ecodesign offers a new perspective for product development.

3.1 Ecodesign Benefits

In general terms, Ecodesign can help companies to enhance their environmental performance. As a consequence, companies can achieve further benefits such as [1]: a) reduction of the environmental impact of products; b) optimizes raw material consumption and energy use; c) improves waste management; d) drives companies towards innovation; e) reduces production costs and so on.

However, some previous studies on application of Ecodesign strategies have indicated that there are some barriers for their implementation. For example, companies have suggested that they do not feel themselves responsible for the protection of the environment, they also do not see clear benefits from implementing environmental protecting actions and they believe that there is no alternative solution at the moment [10]

3.2 Ecodesign Internal and External Drivers

There are some factors which stimulate the implementation of Ecodesign within the company. These can be classified as internal drivers when it comes within the company itself, and external drivers when it comes from the company’s surroundings [10].

Some research works have identified these internal and external drives. For example, the need for increasing product quality, image corporation improvement and the need to reduce costs can be seen as internal drivers in the company. Similarly, new government policies, increasing market demands for environmental friendly products and fierce competition can be seen as external drivers for companies [5].

3.3 – An Overview of the Ecodesign Strategies and the Strategy Wheel

van Hemel has identified 33 ecodesign strategies for the development of environmental friendly products [10]. These strategies were classified in 7 groups and organized in the so-called “Ecodesign Strategy Wheel” (see figure 1) [4]. This wheel provides a basic framework that can be used systematically to review the entire life cycle of a product.

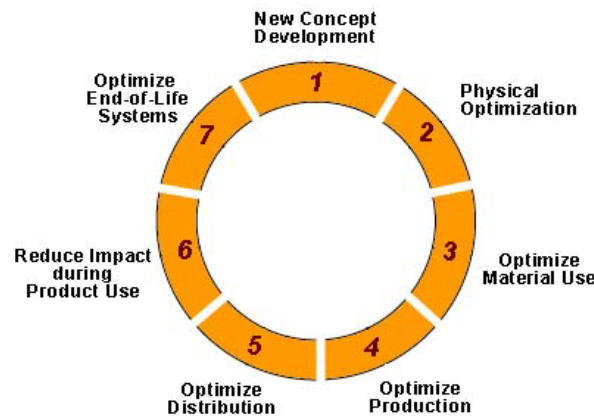


Figure 1 - Ecodesign Strategy Wheel [4]

Optimizing the product’s performance will require a balance of functional, economic and environmental elements. The Strategy Wheel begins with new product concepts, and covers design, materials selection, production, distribution, and the use and end of a product’s life. These strategies should be seen as guidelines that designers should consider when developing environmental friendly products.

Many research works have been carried out to verify the utilisation of these strategies within companies. Some of them were more concerned on the development of environmental friendly products itself [5] while others were more concerned on the utilization of ecodesign at strategic level [7, 8, 10]. In Brazil, the studies on ecodesign issues have also similar variation. Some of the research works have analysed the use of ecodesign strategies within furniture industry at strategic level [11] while others have tried to indicate the potential use of the strategies within SME companies [3].

Despite these efforts, research works on the application of ecodesign strategies in Brazil seems to be very shallow. It is believed that a more detailed analysis is required to evaluate these issues. Therefore, a research work was proposed aiming to tackle the development of environmental friendly products in more detail.

4. Research Methodology

In order to verify the research aims and hypotheses listed in section 2, the following research methodology was established:

4.1 Phase I

The initial phase of this research was based on a literature review when aspects related to the application of ecodesign within SME companies were considered. The study has indicated that the practice of ecodesign strategies varies largely throughout the world. In some countries such as Sweden and Norway, Ecodesign is more largely developed while in other countries it is still in its infancy [8]. The literature review was also important to evaluate why Ecodesign

is so important for competitiveness and which were the main strategies suggested in the literature [9].

4.2 Phase II

Based on the results from the literature review, a questionnaire was developed in order to support the analysis of the use of ecodesign strategies within Brazilian SME companies. The questionnaire was divided into two parts. The first one included the analysis of the internal and external drivers as well as the “roadblocks” for implementing Ecodesign within SMEs. In addition, each Ecodesign strategy was analyzed. The second part of the questionnaire included an open question where the respondents were stimulated to make their comments regarding the use of Ecodesign. As a consequence, 36 SME companies were randomly contacted based on the following classification [6]: Nine companies were considered as micro business (companies which have up to 19 employees). Sixteen companies were considered to be small business (companies which have from 20 to 99 employees) and eleven of them were considered to be medium business (companies which have from 100 to 499 employees). These companies represent many branches of industry such as: Wood Furniture, Packaging, Manufacturing Metal Products, Fibre Glass Products, Glass Products and Clothing Industry. The analysis was based on observations and interviews with designers and/or professionals responsible for product development who had significant experience and a good overview of company methods and procedures. These results are presented in section 5 of this work.

5 Discussion

5.1 External drivers for implementing environmental issues into product development process within SME companies

The analysis of the results have indicated that the three most important external drivers for implementing environmental issues into product development process into SME companies are respectively: i) Legislation and government regulations; ii) Suppliers offering raw material of better environmental performance, and; iii) Environmental pressure from industrial organisations and increasing market demands for environmental friendly products.

These results suggest that the government plays an important role as the main driver for implementing environmental issues into SME companies. The government can introduce new procedures to increase the level of awareness and conscious regarding environmental issues into business. This could be achieved by the adoption of workshops, seminars and training for those companies willing to take part of a general Ecodesign program. In fact, some of these actions have already been taken by the government. However, few of these programs have effectively help companies to change the way they develop their products. Other actions could also include the implementation of a tax reduction program for those companies which develop environmental friendly products.

The lack of local suppliers offering raw material with better environmental performance is considered to be an expensive requirement for developing environmental friendly products at the local market. In addition, most of the companies visited have argued that customers are not willing to pay a higher price for environmental friendly products. Moreover, some companies have suggested that there is not a demand for “green” products.

The third external stimulus is the adoption of ecodesign strategies from main competitors. In order words, SME companies will only become concerned with environmental issues if their

competitors have done the same. As a consequence, environmental issues are not considered to be a strategic issue for their business. These findings are similar to some European countries such as Portugal, Spain, Ireland and Greece [8].

In conclusion, the majority of the companies visited have a “reactive behaviour” in terms of developing environmental friendly products. It is believed that happens because most of the companies visited do not have a strategy plan for growth. They are concentrated on their daily activities and do not establish a medium and/or long term strategic plan for their business.

5.2 Internal drivers for implementing environmental issues into product development process within SME companies

The analysis of the results have indicated that the three most important internal driver for implementing environmental issues into product development within SME companies are respectively: i) A reduction of the environmental impact and costs; ii) An improvement in the corporate image and new market opportunities, and; iii) Interesting long term innovation opportunity.

Despite of these results, it was observed that most of the companies visited are mainly concerned with cost reduction. However, adopting Ecodesign practices can also lead companies to reduce their production costs. As consequence, cost reductions may be used as the main stimuli for companies to adopt Ecodesign practices.

The companies visited have also mentioned that the improvement in the corporate image and new market opportunities could be considered as external drivers for developing environmental friendly products. However, a deeper analysis has indicated that most of these companies do not considered themselves to be technically and financially prepared to develop environment friendly products. In addition, it was observed that there is a lack of vision from the interviewees regarding the potential market for environmental friendly products.

Interesting long-term innovation opportunity comes as the third main internal stimuli. However, in practice, this option seems to be very difficult for companies to implement mainly due to the Brazilian economic instability.

5.3 “Roadblocks” for implementing Ecodesign strategies into product development process

The main roadblocks that were found to affect the implementation of Ecodesign are:

5.3.1 Ecodesign Strategies only becomes relevant if supported by market demands

As mentioned before, due to the lack of commercial vision, most of the companies visited do not believe that there is an internal market demand for environmental friendly products. This does not happen in the European market, which is more environmental conscious and, therefore, it demands environmental friendly products [10, 11]. However, Brazilian SME companies do not have tradition to develop products to the export markets.

5.3.2 Lack of available technical possibilities at the moment

Many companies visited claimed that there is a lack of qualified personnel and technological support to implement Ecodesign strategies into their product development process. In fact, Ecodesign is mainly taught at universities and in postgraduate courses. Therefore, there is a need for more investments on education in order to create a group of professional capable to attend the demand for new product developers. This seems to be the case for some European countries as well [10].

5.3.3 The development of “green” products will bring commercial drawbacks to the companies

It was observed that companies believe that the development of “green” products can become a commercial drawback to their business performance. They are concerned that consumers may not perceive the commercial benefits of these products and, therefore, it is necessary to make clear to their customers that environment friendly products have a competitive advantage when comparing to their main competitive products. In fact, it was observed that most of the companies are not willing to take risks facing the present internal and external commercial situation.

5.4 Comments on Ecodesign Strategies

Comments and conclusions of each group of strategy is indicated bellow. The highest percentage of answers for each strategy is written in bold.

Legend:

☺ - I agree; ☹ - I partially agree; ☹ - I do not agree; ✕ - I do not apply; ? - I do not know

Table 1. Group Strategy 1 - Concept Development.

Group Strategy 1 - Concept Development	☺	☹	☹	✕	?
	Percentage (%)				
In my opinion, my product is “environmental friendly”.	33,3	50,0	8,3	2,8	5,6
When developing a product, I carry out a marketing research to identify end-users’ needs.	80,6	5,6	8,3	5,6	0,0
In my opinion, there is a demand for "environmental friendly" products.	36,1	19,4	36,1	8,3	0,0
If necessary, my company has all the technical skills required to develop "environmental friendly" products.	47,2	22,2	30,6	0,0	0,0
In my opinion, currently products developed in my company meet end-users’ needs.	91,7	8,3	0,0	0,0	0,0

Most of the respondents considered that their products are already “environmental friendly” and that they have adequate technical skills for their development. Despite of these results, it was observed that one of the barriers for implementing Ecodesign strategies within SME companies is the lack of qualified personnel in this area.

In addition, most of the respondents also claimed that they carry out a marketing research and that they meet end-users’ needs. As a consequence, half of the respondents agree that there is a demand for “environmental friendly” products. These results confirm the findings of section 1 which indicated that the government should be seen as the main external driver to stimuli companies to consider environmental aspects into their product development.

Table 2. Group Strategy 2 – Physical Optimization.

Group Strategy 2 - Physical Optimization	☺	☹	☹	✕	?
	Percentage (%)				
When developing a product, we try to integrate different product functions.	55,6	19,4	0,0	25,0	0,0

When developing a product, we try to maximize the reliability and durability of the product.	91,7	5,6	2,8	0,0	0,0
Aspects such as easy maintenance and repair are considered during product's development	58,3	5,6	2,8	33,3	0,0
When developing a product, we try to make it simple without affecting its functionality and/or overall cost	86,1	2,8	2,8	8,3	0,0
Easy-to-follow manual instructions on regular maintenance and repair are developed together with the product.	27,8	25,0	41,7	5,6	0,0
My product is developed based on a modular structure.	52,8	11,1	2,8	33,3	0,0
My product can be upgraded considering functional and/or aesthetical aspects.	66,7	16,7	8,3	8,3	0,0

Most of the respondents claimed that their products are developed in such a way that they are simple, reliable, durable, easy to maintain and repair as well as that their product's functions are integrated and they can be upgraded when considering functional and/or aesthetical aspects. However, it was also observed that most of those interviewed claimed they do not develop an easy-to follow manual instruction on maintenance and repair for their products. This means that customers might have to rely on after sales service to maintain their products on a regular basis.

A modular structure is one of the key product's characteristics to achieve these goals and this is taken into account by nearly half of the respondents.

Table 3. Group Strategy 3 – Optimize Material Use.

Group Strategy 3 - Optimize Material Use	☺	☹	☹	✗	?
	Percentage (%)				
My product is developed using materials or additives which can cause hazardous emissions to the environment and/or health during production.	11,1	58,3	30,6	0,0	0,0
My product is developed using renewable materials.	30,6	5,6	30,6	33,3	0,0
The raw materials used in my product are found far away from their processing and refining or they are difficult to extract.	75,0	11,1	13,9	0,0	0,0
My product is developed with recycle production residues obtained from other industrial processes.	2,8	5,6	50,0	41,7	0,0
My product is developed using spare materials obtained from industrial process.	44,4	11,1	41,7	2,8	0,0
My company has a take-back program for recycled materials or re-use.	61,1	16,7	19,4	2,8	0,0
My product is developed to use less material as well as reduced packaging size and volume.	54,3	8,6	8,6	28,6	0,0

Most of the respondents partially agree that materials used in their products can cause hazardous emissions to the environment. This is particularly true because most of the companies visited were from the wood furniture business which requires the use of solvents and special hazardous chemicals. In addition, they claimed that raw materials are found far away from their processing and refining plant or are difficult to be extracted. As observed earlier, most of the companies visited are on furniture business. The woods used in these

companies come from the northern region of the country which is far away from where most of the companies visited are located.

As regarding to the use of renewable materials half of the companies claimed that they are used in their product. Likewise, it is the use of spare materials obtained from industrial process. In other words, some of the companies claimed that they use this strategy in their product (around 44,4%) and some do not (around 41,7%). (See table 3)

Table 4. Group Strategy 4 – Optimize Production.

Group Strategy 4 - Optimize Production	☺	☹	☹	✖	?
	Percentage (%)				
My product is developed to be manufactured using alternative cleaner energy sources for production process.	5,6	13,9	80,6	0,0	0,0
My product is developed in order to generate less production waste.	77,8	13,9	5,6	2,8	0,0

The great majority of the respondents claimed that they do not manufacture their products using cleaner energy sources such as natural gas. However, most of the respondents claimed that their products are developed to generate less production waste. Based on these results, it is believed that the respondents are more concerned with the reduction of cost production of their products rather than the reduction of their environmental impact. (See table 4)

Table 5. Group Strategy 5 – Optimize Distribution.

Group Strategy 5 - Optimize Distribution	☺	☹	☹	✖	?
	Percentage (%)				
My company considers a re-usable packing system based on a take-back program from the producer to distributor, retailers and end-users.	13,9	2,8	55,6	27,8	0,0
My company adopts recyclable materials for non-returnable packaging and more durable materials for returnable packaging.	36,1	8,3	25,0	30,6	0,0

Most of the respondents claim that they do not consider or do not apply a packaging take-back program in their companies. On the other hand, these companies use recyclable packaging materials or more durable ones. There is, therefore, the need for developing and implementing a re-use packaging system and/or a recycling packaging system for this group of companies. (See table 4)

Table 6. Group Strategy 6 – Reduce Impact during Product Use.

Group Strategy 6 - Reduce Impact during Product Use	☺	☹	☹	✖	?
	Percentage (%)				
My products are developed to be energy efficiency during its use.	8,3	0,0	0,0	91,7	0,0
My product is developed to use clean energy sources.	2,8	2,8	0,0	94,4	0,0
My product is developed to reduce the use of consumables such as water, oil, filters, cleaners/detergents and food/organic materials during its life cycle.	8,3	0,0	0,0	91,7	0,0

The consumables used in my product are considered to be “clean”.	5,6	0,0	0,0	94,4	0,0
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It was observed that most of the respondents do not apply these strategies when developing their products. The reason for that is because most of the companies visited is related to the furniture business and, therefore, they are not main consumer of water, oil, filters and detergents. (See table 6)

Table 7. Group Strategy 7 – Optimize End-of-Life.

Group Strategy 7 - Optimize End-of-Life	☺	☹	☹	×	?
	Percentage (%)				
My product is developed to be totally or partially re-used at the end of its useful life (either for the same application or a new one).	19,4	25,0	22,2	33,3	0,0
All components of my product or at least part of them can be remanufactured to be re-used either for the original purpose or for a new one.	27,8	11,1	27,8	33,3	0,0
All components of my product or at least part of them can be used as materials suitable for recycling.	63,9	16,7	5,6	11,1	2,8
All components of my product or at least part of them can be incinerated without causing any harm to human health.	38,9	13,9	11,1	27,8	8,3
My product is developed to be easy disassembled after its useful life.	50,0	2,8	2,8	44,4	0,0

Most of the respondents claim that all components of my product or at least part of them can be used as materials suitable for recycling and/or incinerated without causing any harm to human health. Furthermore, easy disassembled after its useful life is still observed. Remanufacture of all components or at least part of them to be re-used either for the original purpose or for a new one is not applied to their product subject. (See table 7)

6 Conclusions

This work has shown that legislation and government regulations were the main external drivers for companies to adopt Ecodesign strategies within their product development. The Brazilian government should play an important role in this process by promoting new strategies such as “green seals”, tax reduction incentives and awareness programs to improve the level of environmental conscious throughout costumers in order to create a demand for environmental friendly products.

Regarding internal drivers, cost reduction was considered the most important one. This is because most of the companies are more concerned on the economic aspects of the product development (i.e. cost reduction issues and/or functional quality improvements) rather than the possible environmental impacts of the product.

In terms of ‘roadblocks’ for implementing Ecodesign strategies, most of the SME companies visited consider that there is not a demand for environmental friendly products and that new technologies and the development of “green” products will bring commercial drawbacks to the companies. It is believed that these aspects are inter-related. The lack of demand for environmental friendly products makes companies sceptical regarding investments in this area.

Therefore, in order to catch up with the new trends of European markets, the Brazilian government needs to stimulate the adoption of environmental strategies within SME companies. Some of these actions have already been taken, however, it has not achieved good results so far. It is expected that further research in this area will bring more insights to direct which actions should be taken for a widespread implementation of Ecodesign strategies within SME companies.

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