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Ecodesign in the Context of Customer's and Producer's Point of View

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The present study reviews the attitudes and behaviours of the customers toward products which are "respectful" for the environment. To address the issue in a wider perspective, this paper also encompasses various aspects of ecodesign from producer's point of view. Two surveys were conducted. The purpose of the first survey was to investigate the awareness and intention of the Slovenian customers to purchase green products, their perceptions and attitudes towards green products. The second survey was directed to organizations to examine their attitudes toward green products and environmental issues. The study revealed that the green products have substantial awareness among Slovenian customers. The results received from the study were illuminating, and encourage the possibility for integration of environmental aspects into products, since 94 percent of respondents expressed a desire for more "green" products available on the market. For the customers the most important quality characteristics of the product are: quality, usability and practicality followed by environmental ones. Survey results indicate that environmental concern plays a fundamental role in organizations. According to the results, concern for the environment is the most important criteria that encourage organizations to introduce environmental management system (EMS) standard (mean=4,2 on a scale of 5).

1. Introduction

Moving towards sustainable development is now a major concern in most of the developed countries, resulting in stricter regulations concerning the impact of the products during their manufacturing, use and end of life, including the obligation to define reverse logistics strategies and systems [29,17,21]. Generally, the goal of reducing environmental pressure by consumption can be reached via three routes: greening production and products, shifting demand to low-impact consumption categories, and lowering material demands [20,52,53,54]. While sustainable consumption targets consumers, sustainable production is related to companies and organizations that make products or offer services [56].

According to Amacher et al. [1] customer preference to purchase from "green" organizations is well established and often revealed through increased willingness to pay for products viewed as "clean," i.e., produced with environmentally friendly production or abatement technologies such as recycling and use of less polluting inputs. Leire and Thidell [30] reported that, despite the fact that product related environmental information is lacking for a range of products, available information has a potential to be further used for customer guidance. The assumption is that product-related environmental information, in combination with preconditions such as environmental awareness, knowledge and atti-

tudes, will lead customers to make informed choices when purchasing products [31].

Environmentally conscious design (eco-design) is particularly important in manufacturing industry, and many design methods and tools have been developed to support eco-design [27]. Although there are several different ways to define ecodesign [22], ecodesign may be defined as an activity that identifies the environmental aspects of a product and integrates them into the product design process in the early stage of the product development process [41]. Therefore, ecodesign approach is mainly focused on the environmental aspects of a product. It has been noted that a product must meet the basic requirements of a market. These requirements include the following: (1) meeting the required needs in terms of function, performance, durability, safety, etc.; (2) complying with all standards and regulations; and (3) corresponding to the targeted market segments, such as identifying current and emerging customer expectations [41]. If a product does not meet these basic requirements, then the product will fail in the marketplace even if it causes less stress on the environment [29].

The need to balance environmental considerations and commercial aspects has been underscored by Bird and Prentis [3], who argue that the route to long term integration of environmental considerations into the business activities is to adopt strong customer focus. Also Ritzén [48] mentioned that customer focus is essential

and that, for example, market investigations should include environmental issues. Some researchers have gone even one step further and argued that companies should train their customers in environmental issues [23].

The question that arises here is whether the customer wants a product that is designed in a way that its entire life cycle contributes to environmental protection? Therefore, this paper aims to show the customer's and producer's point of view in relation to environmentally friendly products.

2. Related literature

2.1. Customer focus: understanding customer behaviour

The need to adopt sustainable consumption patterns and lifestyles significantly challenges the designer's traditional focus on new product development. Sustainability provides exceptional opportunities for designers to imaginatively and creatively develop new concepts for material culture [32,26].

As Cooper [8] has written, sustainable consumption involves rethinking how products are conceived and how needs are met. In other words, it requires that we not only address efficiency (i.e. 'getting the same goods and services out of less'), but also sufficiency, (i.e. 'getting the same welfare out of fewer goods and services') [6]. Accordingly, traditional product-centred approaches alone are not capable of providing sufficient change. Highly creative, informed and sensitive design interventions are necessary for the development of alternative solutions that are ecologically responsible, socially relevant, aesthetically pleasing, economically viable, technologically appropriate, and individually satisfying [33].

However, an individual concerned about the environment does not necessarily behave in a green way in general, or in their purchasing [44]. This is known as the value-action gap. Kollmuss and Agyeman [28] explored a range of analytical frameworks as well as external and internal factors that promote pro-environmental behaviour and found conflicting and competing factors related to consumers' daily decisions. They concluded that no single definitive model adequately explains the gap between environmental knowledge and pro-environmental behaviour. A recent study found that people who are environmentally conscious do not necessarily behave pro-environmentally: for example, people might throw rubbish away when most people around them do so, which is a reactive process, as opposed to intentional decision making [40].

Leire and Thidell [31] suggest that further research is needed on how enhanced knowledge on the environmental consequences of products and consumption would influence consumers' actual use of the information. A deeper understanding may reinforce the trust of the labeling schemes as well as making consumers motivated to choose environmentally sound products. Furthermore, Leire and Thidell [31] indicate that consumer motivation may be enhanced if product-related environmental information schemes more adequately document that they result in environmental improvements. Developing environmental evaluation models for environmental information schemes is indeed a research area separate from consumers' perceptions and understanding of the information.

2.2. Corporate focus: towards eco-efficiency

It is important to listen to customer requirements to obtain market needs and make them reflect on the product design [34].

Green product attributes may be environmentally sound production processes, responsible product uses, or product elimination, which customers compare with those possessed by competing conventional products [35,42]. However, the literature does not yet offer an objective definition of what makes a product "environmentally friendly". Fuller [14] define sustainable products as a form and function alternatives that possess positive ecological attributes that are nothing more than enhanced waste management factors (eco-attributes) that have purposely been designed-in (embedded) through decisions concerning how products are made/manufactured, what they are made of, how they function, how long they last, how they are distributed, how they are used, and how they are disposed of at the end of useful service life.

In some product categories, this has led to the introduction of environmental labeling [19]. This may relate to specific product categories, such as organic food, energy saving light bulbs, wood from sustainable forests. Or it may apply to broader environmental product features, as in the case of the German Blauer Engel (Blue Angel) label. In both cases, the rationale is to help customers to recognise environmentally sound products [19]. In that complex context, it has often been noticed that customers do not have competence and time for investigating the environmental impact of products; therefore, those concerned by environmental issues usually prefer to trust a label, given by an external entity, and insuring that the concerned product has a poor impact on the environment [15]. In relation with labeling, Fielding [13] pointed out that ISO 14000 series can

be seen as environmental labeling instrument used to anticipate customer demand, save money and to reduce potential compliance issues. In addition, companies can also expect that this registration would serve as a marketing tool.

Park and Tahara [41] suggest that environmental aspects have to be considered together with other product requirements, such as function, performance, economics, and consumer satisfaction in order for ecoproducts to be successful. By doing this, it is possible to develop a product that possesses a higher product value and less environmental impact – in other words, a product that has a higher eco-efficiency value. Eco-efficiency, which is defined as the ratio of the value of a product to its environmental influence [56], can be used as an analytical tool in ecodesign because eco-efficiency can help create value for a product and the company as a whole by explicitly promoting change toward sustainable growth [51].

Eco-efficiency may also be used in the identification of key ecodesign issues. It is not only effective for the identification of environmental aspects, but also other key issues of a product such as quality, cost, and customer satisfaction. This is because eco-efficiency can consider both the product's value and its environmental impact at the same time [41].

With respect to customer demands, Dalhammar [10] emphasizes the increasing importance of market driv-

ers, although this may not be entirely independent of environmental legislation which places controls on the use of particular substances or components [16].

3. Research results

3.1 Research methodology

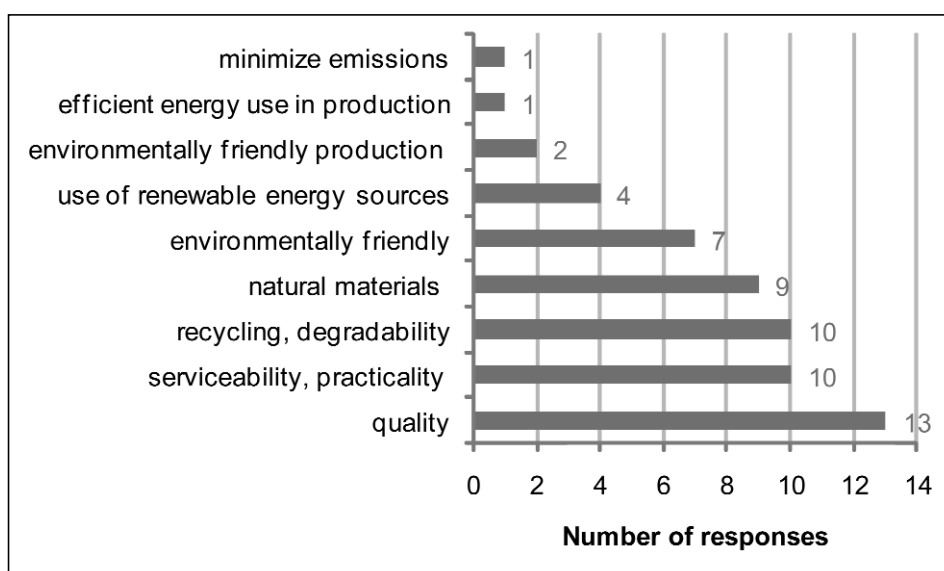
First survey questionnaire was designed, exploring issues relating to customers' attitudes towards green products and to environmental issues concerning the producers in the Slovenia. In total, 50 responses were received within research period.

For the concurrent research study, data were obtained using a second survey among Slovenian producers (sample size was 30). The sample covered a range of industries including automobiles, chemicals, plastics, IT, food and drink, paper, packaging, and some other industries and services.

The purpose of this survey was to examine producer's point of view on the integration of environmental issues in their business and in new product development process.

3.2 The results of the customer survey

Responses to the question on what the customers would give emphasis in product development are presented in Picture 1. The results on the open question show that customers are aware of the importance of consideration of environmental aspects during a product design.



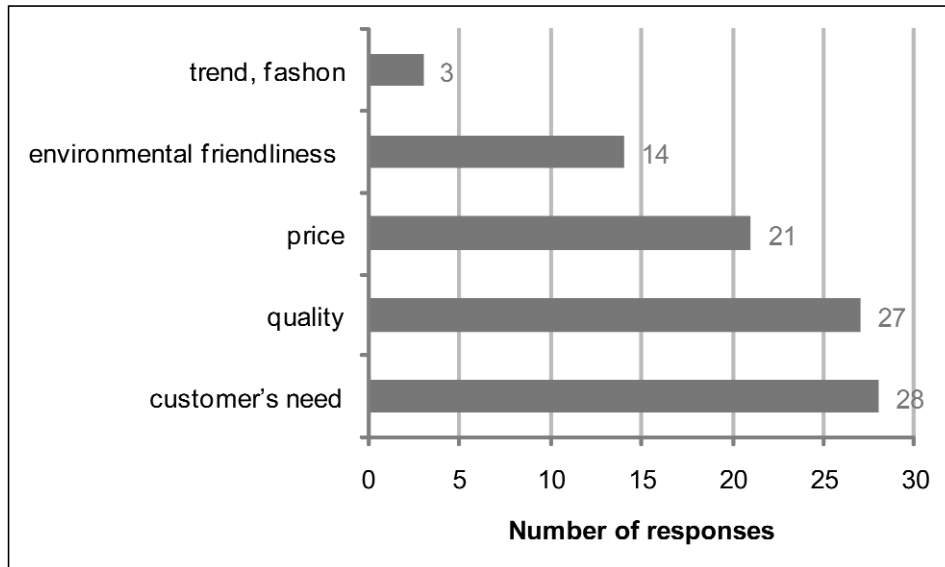
Picture 1: Focus on product development from the customer's point of view

Quality, usability and practicality seem to be the most important factors from the customer's point of view. All the other answers indicate a positive attitude of respondents to the environment as they include only characteristics that are related to environmental protection.

Furthermore, the respondents ranked the five given criteria by importance in the following order: the possibility of recycling, energy consumption in use, the environmental impact at the end use of product, the use of

environmentally friendly materials and environmentally friendly manufacturing process.

The criteria that most affect the purchase of the product are shown in Picture 2. Results indicate that customer's need is the most important criteria, following the product quality, price and environmental friendliness as the fourth criterion. The results presented in Picture 2 are consistent with the results in Picture 1, where the quality and usability were also ranked ahead factors which are related to environmental protection.

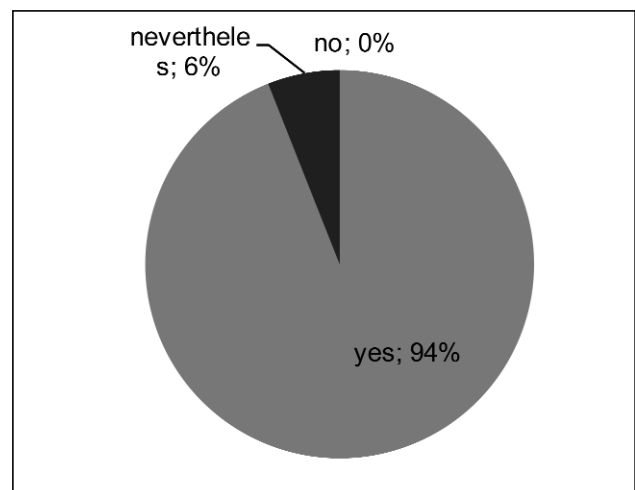


Picture 2: Purchase-decision criteria

The results presented in Picture 2, are to some extent also reflected in the decision to purchase a product that is environmentally friendly, since a relatively small proportion (20%) always decide to buy such a product, 76% of the respondents expressed that they sometimes decide to buy such a product and only 4% rarely choose environmentally friendly product.

Based on the result, it has been shown that 50% of respondents believe that there are enough environmentally friendly products on the market, 46% thought that there is not enough products on the market, while 4% respondents stated that there are enough products available on the market.

Further results are encouraging as well, since 94 percent of respondents expressed a desire for more "green" products to be introduced to the market (Picture 3). No one answered that they don't want more such products, and only 6% have no opinion or are undecided.



Picture 3: Would you like to see more environmentally friendly products on the market?

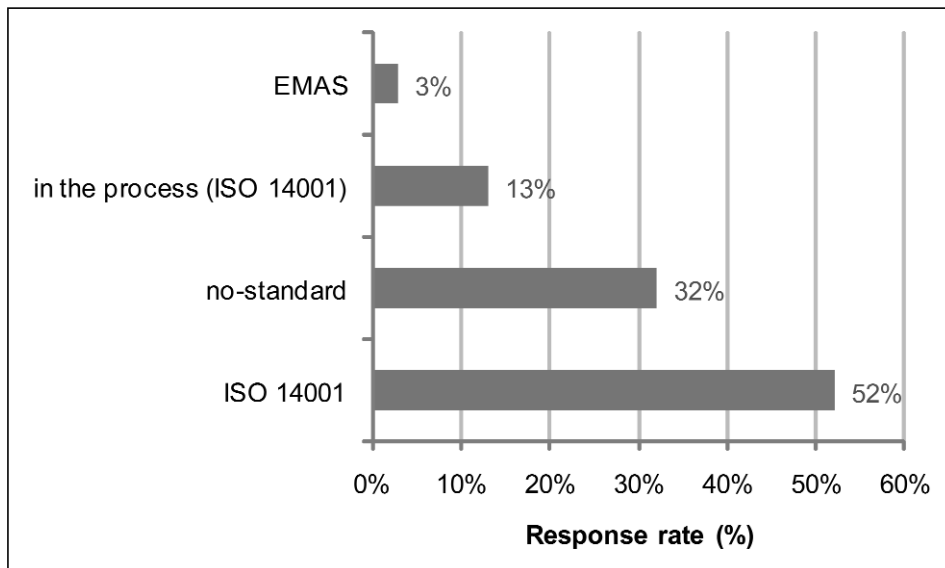
3.3. The results of the producer survey

The results related to the surveyed organizations will be presented in the following section.

The survey covers small (7%), medium-sized (23%) and large (70%) organizations and it provides evi-

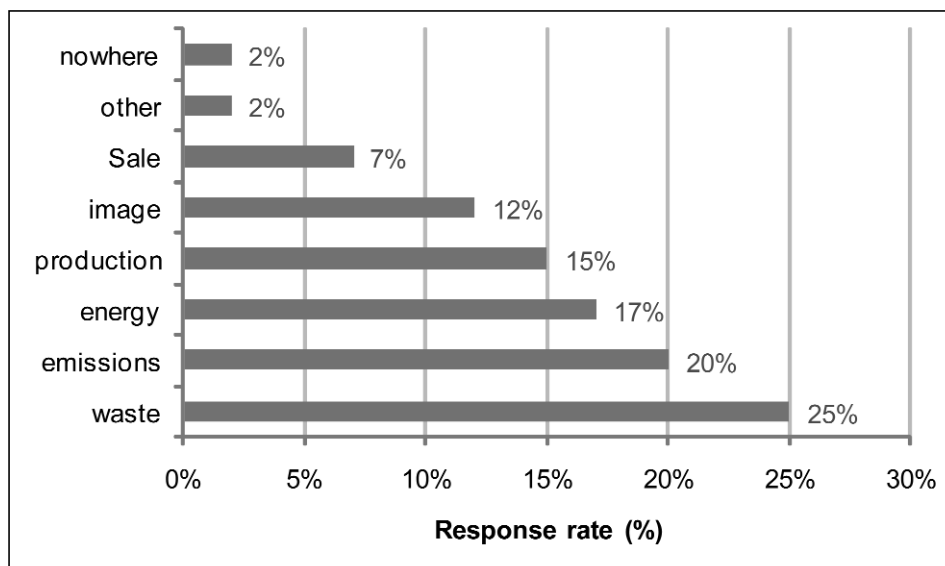
dence on producers' activities towards environmental issues.

From the results in the Picture 4 it can be seen that ISO 14001 prevails among the EMS standards (52%), following EMAS by 3%.



Picture 4: Standards related to environmental management systems

We were interested to seeing to what extent proposed criteria (Picture 5) influence the decision to introduce EMS standards.



Picture 5: Reasons for considering the environmental management system standard

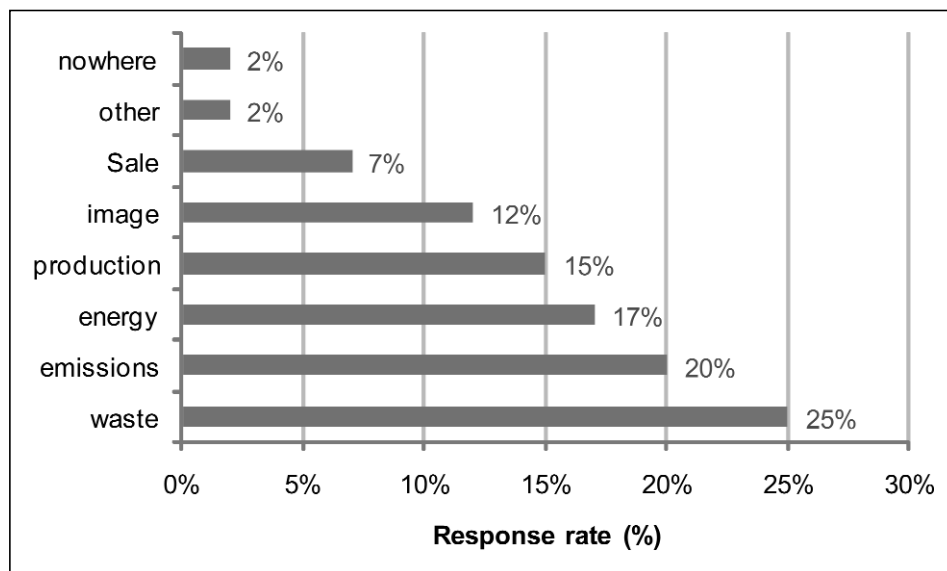
According to the results, concern for the environment is the most important criteria that encourage organizations to introduce EMS standard, followed by competitive advantage, legislation, customers, costs, suppliers, and non-goverment organizations, which influence the least.

The following results refer to planning and introduction of environmentally friendly products.

Despite the fact that 40% of the surveyed organizations have not yet implemented an EMS standard, already

60% organizations have previous experience with the introduction of environmental standards. 77% of organizations produce environmentally friendly products, 23% do not.

The results presented in the Picture 6 show the benefits of the ecodesign from the producer's point of view. Based on the results the areas where organizations see benefits follow as: waste minimization (25%), emissions (20%), energy (17%), production (15%), image (12%), sale (7%), other (2%) and nowhere (2%).



Picture 6: *What are the main benefits of EcoDesign activities?*

4. Discussion

According to the research results, quality, usability and practicality are the highest ranking product characteristics from the customer's point of view as far as product development is concerned. All the other answers indicate a positive attitude of respondents to the environmental protection as they include only characteristics that are related to environmental protection.

Park and Tahara [41] indicate that a product must meet the basic requirements of a market and therefore meet customer's expectations. While producers want to meet customer's needs and expectations, they also want to make higher quality products with minimum production cost. Therefore, for the producers, product value can be defined as product quality versus cost. The improvement of product value can be accomplished by the improvement of product quality, the reduction of production cost, or the accomplishment of these two aspects simultaneously [41].

It is also indicated that environmental concern is reflected in the attitude of customers to product development as well. 86 percent of respondents identified the importance of environmental protection in product development as very important (score 5). Furthermore, the results showed that 72 percent of customers would choose the product which is more environmentally friendly. Among the criteria that influence the purchase decision, customer's need is the most important one, following the product quality, price and environmental friendliness as the fourth criterion. This is also consistent with the findings of Peattie [43], which indicates that if a product does not meet these basic requirements, then the product will fail in the marketplace even if it causes less stress on the environment. Kärnä et al. [25] indicate that satisfying the needs of customers in a profitable way is the core of marketing ideology and in turn is a core of the market economy. Environmental or "green" marketing has been seen as a tool towards sustainable development and satisfaction of different stakeholders [25].

Results indicate a positive attitude of respondents toward intention to purchase green products as well. The results showed that 94 percent of respondents expressed a desire for more “green” products on the market. However, it should be considered that customers who prefer the benefits of environmentally friendly products may not necessarily have motivation to purchase them [11]. Author suggests that for these customers any brand will do, hence there is no environmental information search involved when it comes to choosing their brands and green product labelling may not be meaningful to them. These customers would perhaps trade off product attributes such as quality, warranty and performance in their product alternatives evaluation and selection process [12]. Mintel [37] found that despite pro-environmental attitudes, intention to recycle, concern about pollution and willingness to pay more for environmentally-friendly products, few customers translated these attitudes into regular green buying behavior. Gupta and Ogden [18] reveal that several characteristics of the individual – trust, in-group identity, expectation of others’ cooperation and perceived efficacy – were significant in differentiating between “non-green” and “green” buyers.

The results show that 55% of organizations have already introduced one of the environmental management system (EMS) standards (according to the results, ISO 14001 prevails among organizations by 52%). The results can be interpreted as a good starting point for effective integration of ecodesign activities. This is consistent with previous works [5,24,55] indicating that a certified environmental management system (ISO 14001), leads to an increase in environmental planning activities (design for environment - DFE). Some other studies indicate a weak connection between environmental management systems and ecodesign [2,47].

In the present study, we found that among the factors that encourage organizations to introduce an EMS standard, concern for the environment, competitive advantage, legislation and customers’ attitude are the prevailing factors. Pouliot [46] highlights the importance of a market perspective and therefore indicates that some organizations see the certification according to ISO 14001, as a mean of competitive differentiation, which could be done by creating an environmentally friendly image.

The usefulness of EMS as a tool to manage environmental issues in companies is a question of interest to many different parties [39]. As stated by authors, one of the most interested groups conceivably are the companies themselves, who invest large amount of resources into the implementation and operation of EMS. As a natural follow up they increased environ-

mental work, but also the general value of the standardized EMS as recognized on the relevant markets. Companies are also interested in environmental management done in other business establishments. One of the reasons is to benchmark with competitors on the market [45]. Another growing trend is to demand ISO 14001 certificate from suppliers. According to the Moore and Manring [38], organizations of all size are increasingly being confronted by multiple external stakeholders to demonstrate a commitment to corporate social and environmental responsibility (CSR/CER). As stated by Shamma and Hassan [50], social and environmental responsibility is a dimension that needs to be clearly communicated to both customers and the general public.

Results from our research indicate that waste minimization, emissions, energy and production are the key areas where organizations see the benefits of environmentally friendly design. As stated in literature [4,49] the eco-design is concerned with the development of products which are more durable, energy efficient, avoid the use of toxic materials and which can be easily disassembled for recycling. It is clear that eco-design provides opportunities to minimize waste and improve the efficiency of resource use through modifications to product size, serviceable life, recyclability and in use characteristics [32,55]. In evaluating the environmental impacts of a product, some may want to identify the key environmental life cycle stage of a product, while others may want to identify the key environmental component or material of a product. Therefore, companies have to determine which level of key environmental issues will be identified [41].

5. Conclusions

This paper has focused on environmentally friendly products from customer and producer perspective. In order to understand the gap between customers and producers, we conducted a survey among potential customers and producers. Study results are valuable to both practitioners and theoreticians in their effort to better understand the customers and producers with regard to the environmental protection.

The findings from this research are encouraging to domestic (and foreign) companies. Results showed that potential customers support the movement towards environmentally friendly products. In spite of expressed intention, customer’s needs are still the most influential factor on the purchase decision. It seems very important for the customers, that environmental protection is integrated during the design phase. According to the results, the recycling is the most important environmental criteria.

From the producer's point of view, concern for the environment, competitive advantage, legislation and customers are the prevailing factors, particularly with regard to the decision for environmental management system (EMS) standard introducing (55% of organizations have already introduced one of the EMS standards).

At the earliest stages of the product lifecycle (product planning), organizations need to efficiently identify customer's needs and expectations. With regard to environmentally friendliness, organizations should consider, particularly:

- the focus should not be only on environmentally friendliness, but rather on the quality and usability of the product,
- green products should be comparable in price, brand, usability and performance to "traditional" products,
- organization should seek to meet and represent green approaches by improving quality characteristics with respect to durability, usability, innovations, ... of products,
- organization should support the green purchase decision by providing benefits on the field of environmental protection (human health, climate changes, bio nutrition, ...)
- it is important to bring together the concepts of production and consumption; interaction of organization to market should be considered and there is a substantial potential for improvements,
- organizations should consider the corporate social responsibility (CSR) as a possible route to gain enhanced reputation and competitive advantage at organizational level as well.

Therefore, green products should look and be perceived as "traditional" products; products should not significantly change customer's user habits; products should be comparable in price, while be more cost effective during product life-cycle and provide a sense of contribution to environmental protection.

To move towards improving the environmental performance of products, we recommend the use of ISO/TR 14062:2002 from the ISO 14000 family of standards as a guideline for integration eco-design in a product development process and thus enable organizations to identify and integrate environmental aspects into product quality characteristics.

To obtain more substantial changes, we cannot rely solely on making the existing production system more efficient as they use less resources, water and energy, generate less waste and pollution, but need to follow

the sustainability principles, and thus include economic, environmental and social aspects.

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