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MARKET SUCCESS FACTORS OF SUSTAINABLE PRODUCTS

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ABSTRACT

This article investigates dimensions and factors that according to the perception of business managers drive the market success of environmentally sustainable products. Initially, publications related to new products introduced to the market (with or without environmental focus) were evaluated. Four complementary dimensions were identified as responsible for proper performance: (i) Market Knowledge, (ii) Interfunctional Collaboration, (iii) Knowledge Integration Mechanisms, and (iv) Generative Learning. Considering the above, an exploratory study following a qualitative approach was conducted with managers that work in the Brazilian market. For the choice of the respondents, some characteristics were considered, such as growth in the sector of activity where the organization works, and the area that they manage. Results lead to the validation and ranking of the factors and dimensions mentioned in the literature. They also allowed the identification of new factors as: technological domain, competitive price, quality, company's brand, and payback. Moreover, considering the variables described and the relationships established among them, it was inferred that technological domain can be considered as a dimension. This suggestion is based on the respondents' perception concerning "technological domain", such as: specialized people, research budget, and also budget for facilities and equipment. The study also shows deeper difference among practice areas than among sectors. Based on

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the list of factors that was generated, new studies are recommended to measure the impact of the factors and dimensions on the success of green products.

Keywords: Environmental; Innovation; Marketing Success Factors

1. INTRODUCTION

Focus on product innovation is one way to impart a competitive advantage to an organization working in the industrial market. For this reason, studies on successful product innovation practices have been gaining ground since the late 1980s. At the same time, in light of the current scenario of natural resource limitations, product innovation practices which are environmentally sustainable take on greater importance for companies, apart from being strategic and economically viable.

Within this context, this article investigates which dimensions and factors, from the perspective of managers in the manufacturing industry, drive the marketing success of environmentally sustainable innovation. The objectives center around (i) analyzing whether such individuals consider the measurement suggestions proposed in the literature to be sufficient for evaluating the performance of green products, (ii) discovering what factors they consider most relevant, and (iii) identifying if the sector in which the organization operates promotes differences in regards to the importance of the factors.

This article is organized into five sections. It first presents the dimensions and factors identified through a state-of-the-art survey. Then, the methodological procedures used for conducting the research are outlined. After this, the findings from the field research are analyzed and compared to the data arising from the literature review. Lastly, a list of dimensions and success factors for green product innovation is proposed.

2. LITERATURE REVIEW

2.1 Market Knowledge

According to Iyer (1999), Rennings (2000), Chen (2001), Beise e Rennings (2005), Zhu, Sarkis and Geng (2005), Mickwitz et al. (2008), Kammerer (2009) and Carrillo-Hermosilla et al. (2010), environmentally sustainable product innovation depends on consumers willing and able to acquire such products, environmental-friendly legislation and government incentives, and educational campaigns that

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disseminate sustainable culture among society. According to the mentioned authors, organizations will invest efforts towards innovative cleaner technologies and production processes if these three forces are well intertwined and if companies recognize these external factors.

Complementarily, Cambra-Fierro et al. (2008) and Fraj-Andrés et al. (2009) argued that, when market realizes that organizational practices minimize negative environmental impact, companies tend to obtain benefits related to cost and differentiation. To Chen et al. (2006) and Chen (2009), environmentally sustainable practices add value to a brand as they generate positive awareness towards the brand, as well as increased perceived quality and trust that may positively impact customer satisfaction.

Hanssen (1999), Baker and Sinkula (2005), Lee, Gemba e Kodoma (2006), González-Benito and González-Benito (2008), Peng and Lin (2008), Brito et al. (2008) and Naranjo-Gil (2009) all confirm that market knowledge and organizational adaptation towards market characteristics are positively related to success of environmentally sustainable innovations. Thus, organizations operating at global levels must adapt processes and products to local demand in order to reap increased profitability.

Foster Jr. et al. (2000) state that knowledge about buyers' intentions and buyers' level of involvement in production and consumption of green products directly impact environmental activities promoted by companies. Also Pujari et al. (2003) and Visser et al. (2008) observed that green product development and market success depend on customer behavior analysis, which can generate increased satisfaction, loyalty and positive word-of-mouth. Cetindamar (2007) and Triebswetter and Wackerbauer (2008) also highlight the importance of competitor practice analysis.

Still on the topic of knowledge about buyer behavior and intentions regarding environmentally sustainable products, Bhate and Lawler (1997) found that psychological and situational factors are more influent to the development of environmentally friendly behavior than demographic factors. Similarly, Halme et al. (2006) and Houe and Grabot (2009) showed that when environmentally friendly products increase buyer perceived quality of life, consumers are more likely to acquire them independently of sex, social class, employment and age group.

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2.2 Interfunctional Collaboration

Considering interfunctional collaboration, it is worth noting the study by Byrne and Polonsky (2001), who identified that synergy among different sectors must happen not only internally, but also among the stakeholders involved in environmentally sustainable product development and delivery processes. According to Chen (2007, 2008) and Triebswetter and Wackerbauer (2008), successful environmentally friendly innovation is driven by a mixture of internal and external factors, such as available technology, development costs, consumer pressure and governmental regulations.

In a similar tone, Jabbour (2008) highlight the importance of both organization maturity level and relationships between organizational areas and other players from the delivery chain (especially those responsible for the logistics) for an adequate environmentally sustainable product development process. The same trend is observed by Carrillo-Hermosilla et al. (2010), who evidenced not only how marketing, R&D and operations must act systemically, but also the need for key stakeholder involvement and integration in order to implement green innovation.

Specifically regarding integration among areas as a success factor for environmentally sustainable products, Pujari et al. (2003) identified that there is more interaction than conflicts between traditional and environmentally-oriented product development models. Similarly, Maxwell and van der Vorst (2003) proposed a method for developing effective sustainable products and services integrated into company strategies, business functions and overall supply chain. Hallstedt et al. (2010) confirmed that superior green product development performance requires the complete incorporation of an environmentally sustainable vision into all areas of the organization, as well as the internal availability of incentives for this approach.

As a last aspect of the factor dealing with interfunctional collaboration, Ellram et al. (2008) identified that concurrent engineering can be an important tool for improving environmentally responsible practices in companies. Gonzalez-Benito (2008) states that widespread proactivity and continuous exchanges between different areas promote a distinctive characteristic that drives sustainable innovation performance improvements.

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2.3 Knowledge Integration Mechanisms

Damanpour (1991) map the organizational variables that negatively impact the established mechanisms for knowledge integration, among which are included: risk aversion, traditional rewarding mechanisms, bureaucracy, conservative organizational culture and structure, internal rivalries, and complex, rigid and centralized organizational hierarchies. On the other hand, Sinkula et al. (1997) contend that issues with the interpretation of organizational data and memory can negatively impact organizational performance. Similarly, the study by Barczak et al. (2007) highlights how the use of information and communication technologies can contribute to integrate and preserve knowledge related to new product development processes, and the study by Zancul, Marx and Metzker (2006) suggest that concurrent engineering must be use.

According to Hurley and Hult (1998), an organizational culture that emphasizes learning is a key element for generating positive innovation results in market-oriented organizations, along with participative decision-making, support and collaboration, and power sharing, all of which can be understood as knowledge integration mechanisms. As the authors aptly put it, “researchers would be hard-pressed to make the case that market and learning orientations are not simply antecedents or phases of a process that could be labeled ‘market-driven innovation’”. Similarly, Noble et al. (2002), Baker and Sinkula (2007) and Berchicci and Tucci (2010) conclude that management must translate and disseminate market information all over the organization, allowing the employees to question and adapt organizational knowledge used for innovation means. It seems clear the role of organizational knowledge integration mechanisms as antecedents to innovation.

2.4 Generative Learning

Generative learning is especially dependent on cultural barriers. As Eder (2003) notices, cultural barriers can be an impediment for seizing market opportunities related to environmentally sustainable innovation. Chen (2007, 2008), in a similar tone, shows how superior green product performance can be achieved when the whole organization develops a set of green competences that influence the management processes. To Battisti (2008), the corporate ability to rethink processes according to different lenses allows to reduce the gaps between technological improvements and economic results.

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To Jabbour (2008) and Arevalo (2010), companies oriented towards developing environmentally sustainable solutions are primarily those that develop a consistent way of learning through critical reflective analysis of their actions. Hallstedt et al. (2010) complement this reasoning by emphasizing companies' support mechanism (in particular, its flexibility) among the variables that underpin the success of green product innovation.

2.5 Synthesis of the Critical Success Factors

Considering the literature reviewed, table 1 shows a synthesis of the critical success factors and its constituent elements that influence environmentally sustainable product innovation.

Table 1 - List of Factors for Successful Innovation with Environmentally Sustainable Products

Dimension	Factors
Market Knowledge	Meeting the expectations of consumers Meeting the expectations of society Knowledge of the variables that motivate sustainable purchases Complying with laws and legislation imposed by the government Knowledge about Competitors
Cross-functional Collaboration	Willingness of teams to collaborate Organizational Climate that fosters Sustainable Innovation Integration of the R&D, Production and Marketing departments Formalization and documentation of the PDP Systemic Vision Integration of key stakeholders
Knowledge Integration Mechanisms	Risk Propensity Low Bureaucratization of Processes Effective Internal Communication Investment in Empowerment Use of Simultaneous Engineering Use of Information Technology
Generative Learning	Elimination of cultural barriers Development of green skills Critical reflective analysis ability Flexibility

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3. METHOD

This study is exploratory in nature. Exploratory research is commonly used to measure attitudes and study the behavior of small groups (GIL, 1999). In terms of approach, it was qualitative in nature. Qualitative research is based on small samples, and by delving into the issues, can provide a better understanding of the context under study (MALHOTRA, 2006).

With respect to the data collection procedure, the technique of individual interviews was chosen. To perform the data collection, the interviews were scheduled in advance and conducted personally by the researchers. The elaboration of the data collection instrument took into account the dimensions and factors revealed in the state-of-the-art survey.

Judgmental sampling, a non-probabilistic sampling technique, was used in the study. The Indicators of Industrial Production by Subsectors and Activities of Industry (Brazilian Institute of Geography and Statistics - IBGE) were used as the selection criterion for the sectors that were covered, choosing three for the collection that have been experiencing growth in the last six years (Table 2). After this, different criteria were observed for defining the companies, such as proximity and ease of access for the researchers. Lastly, in terms of those interviewed, managers from marketing, production and research and development departments were considered qualified to answer, totaling nine persons sampled, three per organization.

For the data analysis, relevant excerpts were separated and isolated for coding and categorization, for which a systematic coding framework for comparison purposes was used. The collected data was then first compared with the list generated in the state-of-the-art survey (theoretical comparison), after which a comparison was made between the sectors and departments of the managers who responded in these interviews (internal comparison) (RIBEIRO, MILAN, 2007). Lastly, the interpretation involved the conclusions of the authors regarding the material, taking into account the information obtained in the literature review (OLIVEIRA, 2007).

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Table 2 - Indicators of Industrial Production by Industry Subsectors and Activities of Industry (IBGE)

Manufacturing Industry of Rio Grande do Sul (Brazil)	Feb/06	Feb/07	Feb/08	Feb/09	Feb/10	Feb/11
Food	92.35	98.83	110.13	94.31	87.31	105.11
Beverages	99.15	98.79	87.45	94.45	99.14	98.06
Tobacco	65.32	70.54	63.24	45.98	40.67	110.27
Footwear and Leather Articles	75.31	69.02	71.71	51.73	52.65	98.27
Pulp, Paper and Paper Products	117.66	115.39	119.5	120.61	132.23	93.23
Publishing, Printing, Reproduction of Recorded Media	78.33	82.39	81.39	78.48	71.43	101.52
Oil Refining and Alcohol Production	83.21	94.9	125.03	128.5	105.64	90.23
Other Chemical Products	91.04	97.73	101.72	74.45	102.92	102.75
Rubber and Plastic	96.92	105.01	108.98	79.89	95.81	94.96
Basic Metallurgy	104.16	108.45	124.5	65.13	111.83	94.35
Metal Products	99.47	98.08	108.31	80.85	99.77	105.09
Machinery and Equipment	*90.23*	*100.39*	*125.99*	*87.17*	*111.99*	*111.97*
Motor Vehicles	*121.86*	*139.82*	*174.6*	*115.67*	*167.21*	*103.35*
Furniture	*75.99*	*72.8*	*87.31*	*63.81*	*109.97*	*96.81*

Base: 2002 average = 100

4. Results Analysis

The first question in the interview sought to discover out how the managers who were surveyed view the practice of environmentally sustainable innovations. The majority said that developing green products is important for expanding the organization's competitiveness, in other words, enabling the company to enhance the value of its brand and increase its sales share. Apart from that, some managers understand that engaging in green innovation yields financial benefits from government agencies, promotes significant changes in the structure of the organization and affords technological training. Table 3 contains a summary of the most frequently cited responses.

Table 3 - Importance of developing Environmentally Sustainable Innovations

Important Factors	Times Cited
Expands the company's competitiveness	6
Brings about financial gain	4
Promotes changes in the organization	3
Engenders technological growth	2

In question two, the interviewees were asked what factors they believed to be drivers for successfully marketing green product innovations. The factor everyone cited is the knowledge that companies must have about their target markets. In

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explaining why they consider this to be a factor that ensures success, the managers stated that design and performance must be in line with consumer expectations (*"there's no point having a sustainable product if the design does not stimulate sales"*).

Another factor cited by the majority of the managers interviewed deals with technological mastery, that is, employee skills, research and machinery that organizations must have so that proposed green innovations will generate good market results. Another commonly-cited factor was price. According to managers there is a certain leeway on the part of consumers regarding how much more they'll pay for a product that is greener than another, and this must be respected (*"success depends on the perception consumers have of the product and what they are willing to pay for it"*). Table 4 summarizes the most frequently-cited responses.

Table 4 - Factors that Drive the Marketing Success of Green Product Innovations

Success Factors	Times Cited
Consumer Market Knowledge	9
Technological Mastery	7
Competitive Prices	5
Good Quality	4
Company Brand	3
Financial Return	3

The third question on the survey asked managers about possible interplay between the factors cited in the previous question. All the interviewees agreed that the aforementioned factors are related to each other. In terms of the interplay that managers deemed most important, all mentioned consumer market knowledge as the initial factor, on the basis of which improvements need to be considered and put into effect (but for this technological mastery is needed). In addition, the managers realized that technological mastery is interrelated as a factor giving rise to good quality, competitive prices and desired financial return. The interviewees also listed good quality as a factor that generates positive associations with the company's brand image (reliability) and due financial return.

The next questions refer to the dimensions and factors mapped in the literature as drivers for the successful marketing of green innovations. To make it easier for respondents, they were shown cards with each dimension and its factors, and requested to identify the three most important. The results obtained for market knowledge (Table 5) will be presented first.

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Table 5 - Importance of the Factors from the Market Knowledge Dimension

	Degree of Importance		
Factors from the Market Knowledge Dimension	**1**	**2**	**3**
Meeting the Expectations of Consumers	3	2	2
Meeting the Expectations of Society		1	1
Knowledge of the variables that motivate sustainable purchases	1	**4**	1
Complying with laws and regulations imposed by the government	**5**	1	
Knowledge about Competing Products		1	**5**

Looking at Table 5, it can be seen that the managers interviewed considered compliance with laws and regulations imposed by the government as the most important factor from the market knowledge dimension. The second most important is knowledge of the variables that motivate sustainable purchases, that is, knowledge of the consumer market and the attributes that are valued in this type of purchase. Lastly, monitoring the activities of competitors ranks as the third most important factor in regards to market knowledge. Table 6 presents the results obtained for the cross-functional collaboration dimension.

Table 6 - Importance of the Factors from the Cross-functional Collaboration Dimension

	Degree of Importance		
Factors from the Cross-functional Collaboration Dimension	**1**	**2**	**3**
Willingness of teams to collaborate	1	1	**4**
Organizational Climate that Fosters Sustainable Innovation	1	**3**	1
Integration of the R&D, Production and Marketing departments	**6**	2	1
Formalization and documentation of the PDP	1		1
Systemic Vision		1	

Judging from the importance attributed by managers to the cross-functional collaboration dimension, it is clear that opinions are more divided on this one than in relation to the market knowledge dimension. However, the results indicate that integration between the R&D, Production and Marketing departments is considered the most important factor for successful innovation. Also in regards to the factors from the cross-functional collaboration dimension, it should be noted that the culture of the organization must be geared toward sustainability. Table 7 presents the results obtained for the factors from the dimension of knowledge integration mechanisms.

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Table 7 - Importance of the Factors from the Knowledge Integration Mechanisms Dimension

	Degree of Importance		
Factors from the Knowledge Integration Mechanisms Dimension	**1**	**2**	**3**
Risk Propensity	1		
Low Bureaucratization of Processes	2	2	3
Effective Internal Communication	**3**	**4**	2
Investment in Empowerment		3	**4**
Use of Information Technology	**3**		

For the dimension of knowledge integration mechanisms, two factors tied in the number of times they were cited as first in importance: "use of IT tools", especially with regard to forming the organization's memory, and "effective internal communication". Several managers commented that proper communication coupled with a good organizational climate decreases internal rivalries. Lastly, Table 8 deals with the importance ascribed by managers to the generative learning factors.

Table 8 - Importance of the Factors from the Generative Learning Dimension

	Degree of Importance		
Factors from the Generative Learning Dimension	**1**	**2**	**3**
Elimination of cultural barriers	**7**	1	
Development of green skills	2	**4**	2
Critical reflective analysis ability		1	3
Flexibility		3	**4**

Most of the managers interviewed rated the elimination of cultural barriers within the organization as the most important factor in this dimension, Development of green skills and flexibility are the next most-cited factors. To conclude the interview, the managers, from their perspective, had to rank the dimensions in order of importance. Table 9 contains a summary of the results.

Table 9 - Importance of the Dimensions

	Degree of Importance			
Importance of the Dimensions	**1**	**2**	**3**	**4**
Market Knowledge	**8**	1		
Cross-functional Collaboration		**5**	2	2
Knowledge Integration Mechanisms			2	**7**
Generative Learning	1	3	**5**	

According to the managers who responded to the survey, market knowledge is the most important dimension, corroborated by the responses given in questions two and three. This is followed by cross-functional collaboration and generative learning.

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Comparing the results of the importance given to the factors mapped in the literature by sector of activity investigated and by functional area, it was possible to pinpoint more differences between the areas of activity than between the sectors in which the study was conducted. For example, in the dimension of market knowledge, the R&D and production departments for the most part ranked "compliance with laws and regulations" as the most important factor while managers from the marketing department pointed to the factor "meeting consumer expectations" as the most important.

As for the differences noted between the sectors, the most striking is that none of the managers who work in the furniture sector highlighted the "use of IT" as an important factor in the dimension of knowledge integration mechanisms. Moreover, "integration of key stakeholders" was not designated among the three most important factors for managers working in the automotive sector, when the cross-functional collaboration dimension factors were assessed.

5. Factors driving the marketing success of green innovations

This study enabled new factors to be identified that serve as drivers for the market success of environmentally sustainable innovations. According to the managers interviewed from the manufacturing industries, technological mastery, competitive prices, good quality, company brand and financial return need to be considered, in addition to consumer market knowledge.

Furthermore, taking into consideration the above variables, as well as the established interrelationships, it can be concluded that technological mastery constitutes a dimension. This proposal is based on the variables linked together by the respondents, such as specialized personnel, investments in research and investments in facilities and equipment. Added to this, are the relations between this factor and the others cited in the responses to question three.

Following is a summarized list of the factors that drive the marketing success of green innovations (Table 11). It contains those factors mapped through the literature review, as well as those generated via the managers selected for the interviews.

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Table 11 - Final List of Factors for Successful Innovation with Environmentally Sustainable Products

Dimension	Factors
Market Knowledge	Meeting the expectations of consumers
	Meeting the expectations of society
	Knowledge of the variables that motivate sustainable purchases
	Complying with laws and legislation imposed by the government
	Knowledge about Competitors
	Company Brand
	Competitive Prices
Cross-functional Collaboration	Willingness of teams to collaborate
	Organizational Climate that fosters Sustainable Innovation
	Integration of the R&D, Production and Marketing departments
	Formalization and documentation of the PDP
	Systemic Vision
	Integration of key stakeholders
Knowledge Integration Mechanisms	Risk Propensity
	Low Bureaucratization of Processes
	Effective Internal Communication
	Investment in Empowerment
	Use of Simultaneous Engineering
	Use of Information Technology
Generative Learning	Elimination of cultural barriers
	Development of green skills
	Critical reflective analysis ability
	Flexibility
Technological Mastery	*Investments in Research*
	Investments in Facilities and Equipment
	Investment in Technological Training
	Quality Assurance
	Financial Return

6. Final Considerations

This article explored what factors manufacturing industry managers perceive as being drivers for the market success of environmentally sustainable innovation. In this sense, the dimensions (i) market knowledge, (ii) cross-functional collaboration, (iii) knowledge integration mechanisms and (iv) generative learning, mapped through a literature review, were confirmed as important. In addition, a new dimension emerged which was called (v) technological mastery.

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In that focusing on better products is an alternative for imparting a competitive advantage to organizations, it should be noted that the classification of success factors for environmentally sustainable innovation is an important aspect to be taken into consideration by organizations in strategic decisions related to their portfolio. Thus, the list of factors generated can be used to (i) to support a diagnosis or (ii) serve as a starting point for developing a study of structural equations which quantify the relationship between the variables listed.

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