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Article

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Amfiteatru Economic Journal

Provided in Cooperation with:

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Suggested Citation: Maier, Dorin; Maftai, Mihaela; Maier, Andreea; Bițan, Gabriela Elena (2019) : A review of product innovation management literature in the context of organization sustainable development, Amfiteatru Economic Journal, ISSN 2247-9104, The Bucharest University of Economic Studies, Bucharest, Vol. 21, Iss. Special Issue No. 13, pp. 816-829, <https://doi.org/10.24818/EA/2019/S13/816>

This Version is available at:

<https://hdl.handle.net/10419/281475>

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A REVIEW OF PRODUCT INNOVATION MANAGEMENT LITERATURE IN THE CONTEXT OF ORGANIZATION SUSTAINABLE DEVELOPMENT

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Please cite this article as:

Maier, D., Maftei, M., Maier, A. and Bițan, G.E., 2019. A Review of Product Innovation Management Literature in the Context of Organization Sustainable Development. *Amfiteatru Economic*, 21(Special No. 13), pp. 816-829.

DOI: [10.24818/EA/2019/S13/816](https://doi.org/10.24818/EA/2019/S13/816)

Article History

Received: 12 August 2019

Revised: 16 September 2019

Accepted: 10 October 2019

Abstract

This paper addresses the field of product innovation in the context of current sustainability requirements in order to identify the relationship between sustainable development and product innovation. The demand for products continues to increase but in the same time, the environmental factors are more and more present in the organization policies, in these conditions, the sustainability aspects related to the product developments are becoming a competitive advantages. The structure of the research carried out in this paper is oriented in the first part on the identification of the most used keywords in the specialized literature in the field, and in the second part is focused on a systematic analysis of the literature. The main research questions addressed in this article are: What is the correlation between product innovation and sustainable development? What are the main difficulties in implementing product innovation and ensuring sustainable development? What solutions can be developed to overcome these difficulties? In the first part of the research we performed a keyword analysis using VOSviewer software to identify the most used keywords in the domain. Following the analysis of the specialized literature, we identified some key issues related to product innovation management and sustainable development. The research results indicate a correlation between the success of the product innovation and the sustainable development of an organization. As a solution for better product innovation management, we have proposed a set of indicators that can help organizations measure product innovation performance.

Keywords: product innovation, sustainable development, sustainable innovation, measuring innovation

JEL Classification: O32, O33

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Introduction

Innovation is not only the organization path to success in business environment, but also an essential condition for maintaining it in a highly competitive market (Olaru et al., 2013). In the last two decades, innovation has become an attractive field of study for researchers, who have tried to define, classify and investigate its impact on the performance of organizations, in particular because of its practical relevance.

The work treats sustainable development through product innovation from the perspective of the organization. Sustainable development is the achievement of a better quality of life today without compromising the chance of future generations to the best of life. This means achieving a balance between economic, social and environmental protection. In organizational context, product innovation is about creating a new or improved product in terms of technical-functional features, components, materials, ease of use or other functional features.

The main objective of this research is to identify if there is a relationship between the requirements related to the need for innovation, in particular the product innovation, and the ever-present requirements related to the sustainable development of organizations. In order to achieve the main objective we have structured the research into two main parts. A first part where we wanted to find the most used keywords relevant to the research direction. A second part where through a systematic analysis of the specialized literature we wanted to identify the correlations between product innovation and sustainable development, problems related to the implementation of innovation and sustainable development in organizations as well as to propose solutions to the identified problems (Mikalauskiene and Atkociuniene, 2019).

The research methodology approached to achieve the set objectives involves the analysis of the main works published in the field. The identification of works is done by querying the main databases with the help of keywords, so the use of the most appropriate keywords is extremely important for the success of the research. In this regard, for the first part of the research the question we wanted to answer was: What are the most used keywords in the field of product innovation and sustainable development? We chose this direction of research in order to find out if we need to use other keywords to identify better the correlations between product innovation and its implication on sustainable development. We initiated the study by a search on the two main databases ISI Web of Science and Scopus using product innovation and sustainability as keywords. Then with the help of VOS Viewer software we conducted a keyword co-occurrence analysis to find out what are the frequently studied topics in the domain.

In the second part of the research we carried out an analysis of the main articles in the field to find the answer to the following questions: *What is the correlation between product innovation and sustainable development? What are the main difficulties in implementing product innovation and ensuring sustainable development? What solutions can be developed to overcome these difficulties?* We identified that there is a correlation between innovation and sustainability and we decide to focus only on the product innovation type and we developed solutions for a better management of the product innovation which meets the sustainable development requirements and also open new research direction for the researchers and academics in the field.

The article is structured according to the requirements imposed by a scientific paper, there is an introductory section, a section for the methodology used, a section for the presentation of the results obtained, the conclusions resulting from the research and it ends with the

presentation of the bibliographic titles used. Considering the general nature of this paper as a review of the specialty literature, this part is included in the presentation of the research results. For a better understanding of the context in which this research takes place in the first section of the article we briefly presented the general context of the research.

1. General context of the research

The growing pressure of global competition increase the number of challenges in innovation management in recent years. Firstly, the technological progress make it necessary to combine and accumulate more knowledge dispersed in the fields of science. Secondly, competitive pressure forces companies to speed up development processes to shorten product life cycles. Thirdly, consumer preferences are becoming increasingly diverse, resulting in more product models and variants that lead to target markets and smaller production units (Miller, 2001).

The definition of the innovation concept is related to the introduction of novelty. The evolution of the humanity is revolved around the introduction of new. With the evolution the importance and the volume of these activities increased. A more evidence of this increase can be observed in recent decades when innovation is seen as a way to achieve sustainable economic growth of organizations and society in general (Maier et al., 2019).

An effective implementation of innovation by the organizations is essential in adding value so that its remain competitive and also developments in current economic climate (Maier et al., 2014). There is some resistance in an effective innovation management system implementation, but good communication with staff and external partners, as well a leadership focused on competence and awareness could reduce it (Maier et al., 2016).

A company should be aware that in innovation processes management may occur certain risks and cause failure of the potential innovation projects. If the company can identify, assess and address these risks, it will significantly enhance the success and effectiveness of innovation processes management in the company (Lendel, Hittmár and Latka, 2015)

Innovation acts systemically, covering all the activities of an enterprise, from R & D to personnel, all functions of the enterprise are under the impact of innovation, its scale and deployment vary, depending on the nature of the activity. For a better approach of innovation we decide to focus only on the product innovation and its role on sustainable development.

Through product innovation, the company can achieve a competitive advantage by differentiating its production and increasing the quality and variety of goods that allow it to grow demand and open up new growth opportunities (Leon, Martinez and Castillo, 2005; Brad, 2008; Brad, 2010; Camisón and López, 2010).

Product innovation refers to the development of goods or services with characteristics or intentions of use that differ significantly from previous products made by the enterprise. Product innovation includes significant changes in technical specifications, components and materials, embedded software, friendly use, or other functional features (Maier et al., 2014).

Considering more and more restrictive regulations and given the increasingly importance of sanogenetic and environmental criteria in a highly dynamic and complex competition, many organizations are concerned to improve the performance results in relation to society as a whole, with certain focus on promoting sustainable development principles (Olaru et al., 2010; Popescu et al., 2012).

The concept of sustainable development appeared initially as a response to the intense exploitation of the natural resources and the increase of industrialization that led to degradation of the environment. If in its early stage the concept was mainly about the preserve of the quality of the environment now the concept expanded also on the complexity of the quality of life including economically and socially aspects. To better align cleaner production within business and society, organizations can enable sustainability activities as a catalyst for change (Sroufe, 2017). The evolution of the concept and its increase importance can be also noticed in the concerns in justice and equity between states, not only between generations (Burz, 2012; United Nation, 1992). Sustainable development is define as being the way of development that, for now, does not jeopardize the chances of development for future generations. As a structure, it includes the *energy*, the *environment* and the *human resources* components (Maier et al., 2019, Kozlovskiy, et al., 2018).

The discussion about Sustainable Development requires a closer look at the question of how to achieve this massive transition towards a new global paradigm. The world and our global society require a shift towards a more responsible treatment of environmental, social, and economic capital. For this reason, new ideas and innovations must be created.

At the European Council ambitious goals were set, like reducing greenhouse gas emissions, producing renewable energy or increasing energy efficiency, according to the Kyoto Protocol – all this should be achieved by 2020, as part of the implementation of the Energy-Climate Change package. In order to reach that goals it is required to develop some new economic models that integrates environmental concerns into the production process and the resulting products.

Sustainable development must be seen as an adaptation of society and the economy to the great challenges humanity faces today. People are at the heart of sustainable development concerns. They have the right to a healthy and productive life, in harmony with nature.

We cannot talk about development without innovation, because innovation is the basis for sustainable development in any field. If we had no ideas, we have nothing to develop! (Vasile, n.d.). A way for companies to meet the challenges is to have a good, complex, but in the same time, a simple model of innovation management that offer all the information and tools for managers to control the innovation process in their organizations. This model needs to cover all the important components of a business system that can help identify true performance in an organization.

2. Research methodology

In addressing the first research question, we searched the ISI Web of Science database to find articles that contained keywords such as "product innovation" and "sustainable development" in title, summary or keywords (table no. 1). The purpose of this search is only to identify other potential keywords, often used in literature that could lead to the identification of other important works in the field. The articles selected in the sample were first chosen using the filters provided by the database such as, document type: article, language: English.

Table no. 1: Search criteria

Topic	“product innovation”	243604
Title	“product innovation”	8128
Web of Science Category	Business, management, economics	
Document type	article	50340
Research years	All	
Topic	“sustainable development”	130425
Title	“sustainable development”	1250
Web of Science Category	Business, management, economics	
Document type	article	12772
Research years	All	

Considering the purpose of this search we limit the sample of papers at the top 500 paper according to their number of citations. The articles selected in the sample were chosen first by using the filters offered by the WoS Database like, document type: article, language: English. Next the articles were distributed according to their number of citation. For this paper we use the VOSviewer software to create a visual representations or a so called ‘network maps’ of the relationships between multiple keywords used in the field. The sample database were exported from Scopus database in .csv (comma separated value) file format, required by the VOSviewer software.

The next research questions were addressed by adopting an inductive approach of the research because the purpose of this study is to identify the importance of product innovation management for sustainable developed of the organizations. The majority of data used in our research are secondary data, collected from different bibliographic databases, full-text databases, numeric databases or even special purpose databases.

The collection of data was made by the use of keywords and the results were filtered by using Boolean operators and syntax. We evaluate and analyze the obtained data based on several criteria like the date of data collection; we try to have bibliographic sources as current as possible; the dependability or the source credibility; the content of data. The majority of data available in the innovation field are qualitative data, thus the first challenge of the research was to transform a part of qualitative data in quantitative data. For this, we used a content analysis and a grounded analysis of the qualitative data.

In order to have a sustainable development we need to have the necessary tools to evaluate the current situation regarding innovation in the organization. In order to develop these tools, we first conducted an extensive review of the existing literature in the domain and related domains focusing on other models of product innovation management.

3. Research results and Discussions

3.1. Topical focus in the sustainable product innovation field

In this part of the research we address a keyword co-occurrence analysis (Figure no. 1) to identify frequently studied topics in product innovation and sustainability field, as well as their relationship. In their paper the researchers Zupic and Čater (2015, p. 435) explain what is the importance of a keyword co-occurrence analysis: “When words frequently co-occur in

documents, it means that the concepts behind those words are closely related. The output of the co-word analysis is a network of themes and their relations that represent the conceptual space of a field". More than that through a keyword co-occurrence analysis can be reveal which keywords are often jointly mentioned, or combined by authors, thus revealing patterns and trends in the specific studied topics (Callon, Courtial and Laville, 1991; Cambrosio et al., 1993).

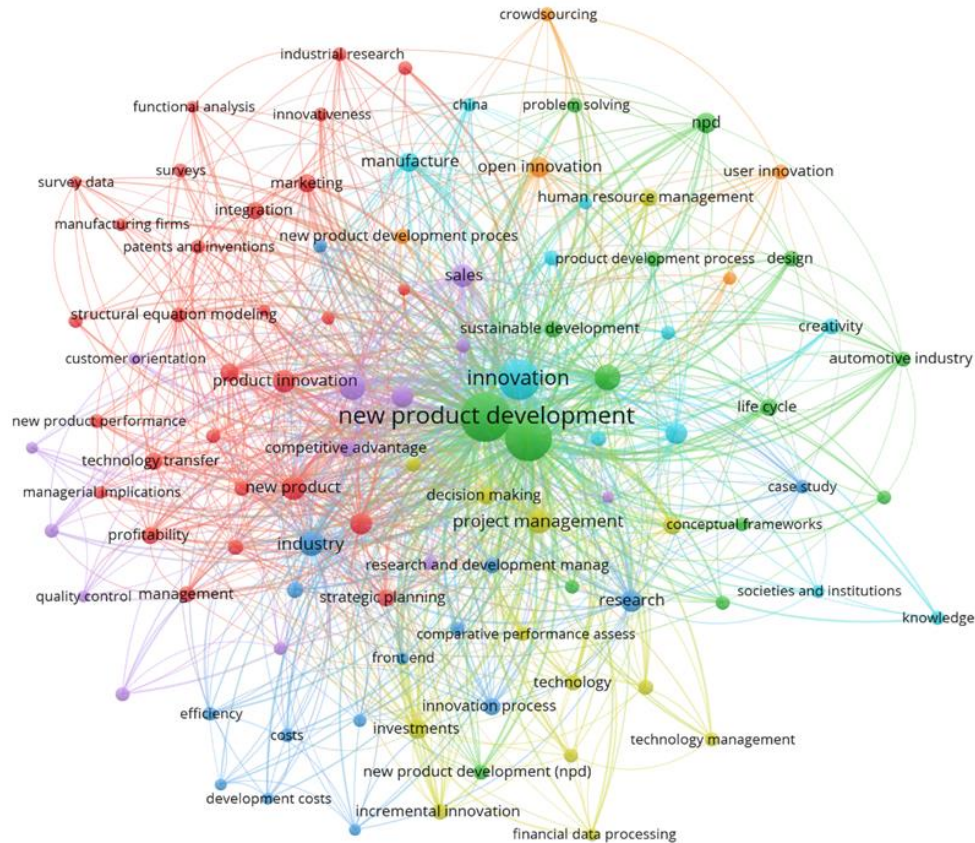


Figure no. 1: Keyword co-occurrence map for sustainable product innovation articles

Source: capture from VOSviewer software

The keywords co-occurrence map is generated based on 2930 keywords found in the 500 documents from the sample database. Among this 143 meet the threshold of having five minimum number of occurrence. According to the Zupic and Čater (2015), there are two important things that the keyword co-occurrence map visualizes: "(1) frequently occurring keywords, based on their prevalence, and (2) how the popularity of keywords changes across specific periods of time" (Zupic and Čater, 2015).

The VOS viewer software generated seven clusters for the keywords occurrence analysis. The size of the clusters varies from 28 items in the bigger cluster, the red one, and 5 items in the smaller cluster, the orange one. This number of clusters were generated because in our

database we did not limit the paper by their field of research and there are a variety of papers from the business and economic field to IT and technology.

The red cluster is the biggest cluster and it general groups keywords like product innovation, new products, economy, research and development, radical innovation. The keywords with the highest number of occurrence are “product innovation”, having an occurrence of 36 times and a total link strength of 197. Other keyword in the red cluster is “new product” with an occurrence of 41 and the total link strength of 308.

According to the number of items the second cluster is the green one that group 15 items. The keywords in this group are the most highlighted in the map, they are situated in the middle of the map. The most used keyword in our sample of papers is “new product development” with a co-occurrence of 430 times and a total link strength of 1939. Other important keyword is related to the first one is “product development”, occurrence of 332 and total link strength of 1722. Another keyword from this cluster is “product design”, occurrence 59 and total link strength 310.

The next clusters are grouping almost the same number of items and the highlighted keywords are “innovation”, occurrence 226 and a total link strength of 1039 from the light blue cluster. “Industry” from the dark blue cluster, with an occurrence of 47 and a total link strength of 314. Other keyword is “commerce” with an occurrence of 53 and a total link of 380. With an occurrence of 9 is the “project management” keyword and a total link strength of 313. The rest of the keywords have less occurrence and are covering a large panels of discussion like “seals”, “open innovation”, “human resource management” or “automotive industry”. In the map we can identify also an important keyword for this research, the “sustainable development” keyword with an occurrence of 19 and a total link strength of 90, this small occurrence of this keyword can be explained by the fact that we decide to use only the first 500 papers according to the number of citations and there is an obvious disproportionate ratio between the number of papers in the innovation field and in the sustainability field.

As a conclusion from analyzing the keywords co-occurrence map presented in figure no. 1, we identified that beside the initial keywords “product innovation” and “sustainable development” we might find interesting approaches if we use also key words like “new product development”, “new product” or “product development”.

3.2. Main issue in the product innovation field

After the identification of the main keywords used by the researchers in the product innovation field we performed an extensive literature review in order to identify the main issues and solution for a better management of the innovation process such as to be a support for a sustainable development of the organization.

The starting point of the discussion about product innovation is the reality of today's society where customers have the possibility of choosing from a larger than ever variety of products. This is felt by the organization as a huge pressure to continue improve their products and therefore product innovation is the solution.

Product innovation is a type of innovation that probably people think when discussing about innovation. According to the Business dictionary product innovation is “the development and

market introduction of a new, redesigned or substantially improved good or service. Examples of product innovation by a business might include a new product's invention; technical specification and quality improvements made to a product; or the inclusion of new components, materials or desirable functions into an existing product (BusinessDictionary.com, 2019).

In this fast changing economic environment every organization should have the power of transforming and adapting to the new market requirements. But the rush for maintaining competitiveness or increase the power in the market is not quite simple. In his work Plewes (2016) argue that “even the most successful organizations sometimes forget “the obvious.” What is the most obvious thing about product innovation? Innovation does not stem from implementing new technology or design facelift. It is a direct result of clarity around business objectives and customer value. These regularly fall by the wayside during product development discussions because of factors like operational costs, timeframe pressures, or even plain old-fashioned human fallibility. The process that guides product innovation should be shaped by business goals, customer needs, and budget”.

We also need to consider that, as Ten Napel (2017) observed in a fast-changing technology landscape, it is virtually impossible for a business to master all the technologies, or acquire the competencies to handle every aspect of product innovation to deliver a ‘WOW’ customer experience. The key to success in such a demanding environment is the ability to identify your strengths or core competencies, and have the rigor, focus, and discipline to stick to them (Ten Napel, 2017).

Dereli (2015) identify that to sustain competition, to survive and to grow, companies are forced to make new products continuously. Furthermore, to compete in market conditions determined by innovative approaches a series of issues can be determined (among which we highlight):

- Innovation should be considered as a life style and the environment which encourages innovation must have a strategic priority;
- For the development of innovative strategies, scientific, technological and administrative changes in the world should be monitored closely;
- Innovation process must be formulated and performed in a customer-oriented way. Timing and application of innovation is important because of the shorter lifespan of commercial products;
- Innovation doesn't have to be expensive but have to be new to be effective. An innovative company must be able to maintain viability and provide better service to the customers;
- The establishment and management of cooperative networks between the companies which exchange know-how and ideas provide a basis for accumulation of common knowledge and facilitate achievement of innovation objectives for each of them. The probability of success for innovation is higher if the innovation has been produced by a teamwork;
- The main objective of the companies are to be successful in all areas. Nevertheless, companies can use their failures as an innovation tool, instead of hiding them.

In the current business environment a sudden change calls for sustainable business models. Therefore, the concept of sustainability has become essential to help firms achieve their performance targets. High sustainability helps firms to improve different processes which make them outperform competitors in the long run. Managers are strongly recommended to enhance sustainability as it can significantly contribute to firm performance.

A sustainable competitive advantage according to Kuncoro and Suriani (2018), is considered “when the existed or potential competitors can not duplicate or the cost to imitate is too high. When following strategic resources based view, corporate's resources must be valuably utilizing chances/or neutralizing threats, this must be scarce, imperfect imitable, and not bias to have equal changes for sustainable human resources” (Kuncoro and Suriani, 2018).

The researchers Srivastava, Franklin and Martinette (2013) identify that “in long term competitive advantage, companies acquire sustainable competitive advantage through their ability in developing a set of main competence so that they can service their targeted customers better than their competitors. The main competence refers to a set of unique competence which is developed in a company in its main fields, such as quality, customer service, team coaching innovation, flexibility, responsiveness so that it can sur-pass its competitors” (Srivastava, Franklin and Martinette, 2013).

The research results of Kuncoro and Suriani (2018), showed that “the higher new product innovation, the higher sustainable competitive advantage, which means that new product innovation really has an effect on sustainable competitive advantage of an organization. Because it is not easily imitated, then this is a competitive strategy to support the success of a vendor for a long period of time”.

In order to address this issue is obvious that a good management of the innovation is needed. Management innovation is a relatively new and still an under-researched form of organizational innovation (Birkinshaw, Hamel and Mol, 2008; Birkinshaw and Mol, 2006; Damanpour, Walker and Avellaneda, 2009; Vaccaro et al., 2012). Yet, in the field of strategic management, it is a significant topic (Wu, 2010). Birkinshaw, Hamel and Mol (2008) categorize four perspectives on management innovation. Firstly, the institutional perspective addresses institutional conditions which stimulate emergence and diffusion of management innovation; secondly, the fashion perspective views management innovation as a management idea that can be propagated on the market; thirdly, the cultural perspective incorporates organizational culture as an important condition for how management innovation is shaped in an organization; and, fourthly, the rational perspective has a central role for human agency.

3.3. Solutions for a better management of the sustainable product innovation

A good way to meet innovation challenge is to have appropriate tools and methods to use in evaluating innovation performance for a better control and management of the innovation process in the organization. The evaluation model needs to cover all the important components of a business system in order to identify real issues that should be addressed to leverage innovation results. Our study started from the need to have better ways to evaluate innovation performance and to propose appropriate improvement solutions. The evaluation process is important because it can enhance the overall business performance.

There are many ways to measure the productivity of product innovation; therefore, choosing the most appropriate measurement indicators requires a degree of selectivity. For a more accurate choice of indicators to measure innovation, first it is important to have a definition of the term “indicator” in this context. An indicator can be defined as something that helps us to understand where we are, where we are going (what we are heading for), and how far we are from a certain goal / goal. From literature review (Calik and Bardudeen, 2016; Gault, 2018; Maier et al., 2017; Sart, 2014; Olaru et al., 2015; Maritz, Shieh and Yeh, 2014; Maier et al., 2018) we identified and formulated a set of indicators, presented in table no. 2, which can be used to measure the performance of product innovation in an organization.

**Table no. 2: The proposed set of indicators
for measuring the product innovation performance**

Product innovation indicators	
Income received from new product/service	Percentage of ideas materialized in a new product/service
The time to develop the new idea	Degree of change of innovation during product realization
New product/service sales	Product efficiency (result/effort ratio)
Number of patents / trademarks / models	The number of prototypes that reached serial production
Number of products/services with changes in functional and/or technological design	Number of products/services with the latest technological innovations
Number of products with changes in raw materials, materials and components used	Number of new products/services placed on the market
Number of products with changes in shape, appearance, dimensions (a new design)	The number of inventions completed by an innovation
Speed of development of new products/services	Number of registered national and international patent applications
Number of technology transfer processes	Number of products and technologies produced and techniques with demonstrable impact (or applicability in the economy)
Return on investment in the development of a new product/service	Percentage of innovation projects from year to year (evolution of innovation projects)

The set of indicators have the purpose of helping managers to achieve a level of product innovation performance that implies reaching sustainable development an overall performance of the organization. The proposed set of indicators can be seen as a tool to better manage the product innovation process and to identify the existing limits in an organization. Also the indicators can allow a better identification of the areas in which some extra solutions must be taken.

Product innovation management includes improving the very process with which products are created, produced, launched and delivered to a dynamic marketplace. To do this successfully, organizations need to have a business model in place that promotes collaboration, essentially communication with and participation of business partners, customers and employees (Constantinides, 2011).

Conclusions

There are definitely a lot of changing in the current globalized economy, with the rapid progress of technology that will ultimate impact the customer behavior. We can observe now the big amount of products existent in the market, far more than ever before, we can say that the products evolve and increase continuously. If we look back to the history we can observe that over the past century, the leaders of the industry have learned to master very well the production process and this in such a way that now it no longer function as an important competitive advantage. Some new challenges arrive like the achievement of the sustainable business development by innovative process – exploiting the change, developing new competitive advantages by providing better products and services, running better processes or even delivering completely new solutions.

This rapid change of products demand forced organizations to find better solutions in order to be competitive. As stated by Ohr (2016), we are now in an Age of the Customer, where consumers are in control of their interactions with businesses. Inundated by endless sources of information, customers expect ready access to content that is personally relevant in the context of what they are doing and accessible anytime, anywhere, and in the format and on the device of their choosing. Attracting, winning, and retaining customers in this environment requires a concerted effort from across the business: The organizational structure, company culture, and business technology must all be aligned in service of the customers, in the spirit of delivering them exactly what they want. For this reason, digital and customer experience strategies are inexorably linked. Most every change that organizations make to aid in their digital transformation is also in pursuit of a better customer experience, whether directly or indirectly (Ohr, 2016).

For individual organizations and society in general, the innovation skill is vital to ensure development and competitiveness in the coming future. To be able to innovate, people are well trained and willing to get involved in this investment in innovation. In addition, that is not only because global economic progress is expected of humankind due to innovation, but also because in the situation of diminishing the material resources, no country in the world will be able to develop without creating the conditions for using the most at hand resources, still inadequately used, the human mind.

For the future research we identified that in the field of sustainable product innovation beside the initial keywords “product innovation” and “sustainable development” we might find interesting approaches if we use also key words like “new product development”, “new product” or “product development”.

By offering a set of measurement indicators we offer a tool that can help organization to better manage their product innovation performance. Even if innovation in general, has aspects that cannot be measured, some of its dimensions can be quantified and analyzed. From the managers point of view this study offers a tool that can be used to identify where the weak points of the innovation in their organization are, and if they wish they can attempt to intervene and correct them in order to fully benefit from the innovation advantages.

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