Journal of Cleaner Production 313 (2021) 127873

Contents lists available at ScienceDirect

Journal of Cleaner Production

journal homepage: www.elsevier.com/locate/jclepro

Orchestrating capabilities, organizational dimensions and determinants in the pursuit of green product innovation

Jakeline Serrano-García [a,b,*], Andrea Bikfalvi [c], Josep Llach [c], Juan José Arbeláez-Toro [d,e]

[a] Universitat Politècnica de València, Valencia, Spain
[b] Faculty of Economic and Administrative Sciences, Instituto Tecnológico Metropolitano, Medellín, Colombia
[c] Department of Business Administration and Product Design, Universitat de Girona, Girona, Spain
[d] AMADE, Polytechnic School, Universitat de Girona, Girona, Spain
[e] Faculty of Engineering, Instituto Tecnológico Metropolitano, Medellín, Colombia

ARTICLE INFO

Handling Editor: Dr. Govindan Kannan

Keywords:
Green innovation capabilities
Organizational dimensions
Determinants
Green product innovation
Taxonomy
Matrix
Manufacturing firms
Sustainability
Environment
Framework.

ABSTRACT

There is now evidence of a growing demand for green product innovation (GPI), leading to reduced negative environmental effects. This context is an opportunity for the organizational reconfiguration of companies in the manufacturing sector to accommodate these new product attributes and characteristics. Although the identification of the determinants of GPI has improved, its characterization is still fragmented and there is limited coherence in terms of the administrative approach leading to GPI development. The main purpose of this paper is the selection and configuration of the determinants of GPI and their organization into an innovation management model. This is achieved by identifying and categorizing the determinants of GPI in association with green innovation capabilities (GIC) and organizational dimensions (OD). The results provide a set of determinants of GPI, paving the way for organizational challenges, the adaptation and definition of new GIC, and the selection of green-oriented OD. All the above is represented in a framework showing the structural relationships and operationalized in a matrix product of the taxonomy referring to how the determinants of GPI affect GIC and OD, thus facilitating the definition of the variables that assess the progress of the company in pursuit of GPI. This research contributes in the field of management and organizational theories for the managerial transition to sustainable development from the dynamics typical of innovation. It also widens the scope of study for researchers, manufacturing company managers, and governmental bodies responsible for environmental management.

1. Introduction

Political, institutional, and individual actors' growing interest in promoting environmental sustainability (Chang, 2017; Kong et al., 2016; Su et al., 2017) has put pressure on the market to design innovative products with minimal environmental impact (Hukkinen, 1995; Melander, 2018). These products, referred to as green product innovation (GPI), can potentially become a novel business opportunity for manufacturing firms, helping them to meet these new demands and expectations.

GPI distinguishes itself from conventional innovative products (CIP) (Chen and Chang, 2013; Pons et al., 2018) because the resulting products impact on socially conscious customers who are willing to pay a higher price for them (Niedermeier et al., 2021; Sana, 2020). It also favors the potential motivations of governments by trying to offset the cost of achieving a sustainable development (Sana, 2020; Wang et al., 2020). This is translated into a comparative and competitive advantage given that GPI brings benefits for firms while helping to preserve natural resources for future generations (Pérez-Pérez et al., 2021).

However, many organizations are not yet convinced about producing and developing green products for various reasons, including the high investment involved (Rehman Khan et al., 2018), the risk aversion when making financial investments (Stucki, 2019), and limited government support. Also relevant is also the lack of studies aimed at consolidating GPI from organizational and management theories (Dangelico et al., 2016) and the lack of clarity on how to address its determinants at the organizational level (Jasti et al., 2015; Tariq et al., 2017). For GPI development, every area of the firm must be involved (Hukkinen, 1995)

* Corresponding author. Faculty of Economic and Administrative Sciences, Metropolitan Technological Institute, Cl. 54a #30-01, Medellín, Colombia.
E-mail addresses: jakelineserrano@itm.edu.co, jserano2005@gmail.com (J. Serrano-García), andrea.bikfalvi@udg.edu (A. Bikfalvi), josep.llach@udg.edu (J. Llach), juanarbelaez@itm.edu.co, jjarbetoro@gmail.com (J.J. Arbeláez-Toro).

https://doi.org/10.1016/j.jclepro.2021.127873
Received 6 January 2021; Received in revised form 13 May 2021; Accepted 6 June 2021
Available online 9 June 2021

because the process of designing, creating, producing, and marketing green products requires an interdisciplinary approach (Ulrich and Eppinger, 2012).

Various studies report that there are certain determinants for the production and marketing of innovative green products (Chen and Chang, 2013; Dangelico and Pujari, 2010; Dangelico and Vocalelli, 2017; Lee and Kim, 2011; Melander, 2017; Tsai, 2012). These generally involve improving and using environmentally friendly materials (Ma et al., 2018); manufacturing products with recycled components; reducing energy consumption; using less packaging (Chen and Chang, 2013); and reusing, remanufacturing, and recycling inputs to reduce the harmful effects on the environment (Dangelico and Pujari, 2010).

Studies have been conducted in fields like innovation and environmental economics and management to identify the factors that drive organizations to develop GPI (Alharthey, 2019; Chang, 2016; Tan et al., 2019). However, there is still a fragmented and disconnected approach to this identification (Jasti et al., 2015; Tariq et al., 2017), hindering the achievement, shaping, and implementation of GPI at the organizational level (Chang, 2016; Jasti et al., 2015). Furthermore, there is no consistency among the different factors and theoretical approaches leading to its development (Dangelico et al., 2016; El-Kassar and Singh, 2019; Jasti et al., 2015; Sdrolia and Zarotiadis, 2019).

Further analyses are required to examine how firms integrate corporate sustainability with the support of organizational management, under a systemic perspective and with a holistic vision (Engert et al., 2016), thereby strengthening the different determinants to achieve environmental sustainability. Furthermore, given the need to evolve towards environmental protection, organizations must adopt new or significantly improved innovation management systems based on organizational support models to underpin the creation, design, and implementation of the required changes (Robledo-Velásquez, 2019).

The Resource-Based View (RBV) theory has so far been the most widely used to study how organizations manage green innovation (Tariq et al., 2017). According to this theory, firms with the best resources and capabilities (and their orchestration with the firms' activities) may gain comparative and competitive advantages in terms of environmental sustainability (Hart, 1995; Hart and Dowell, 2011; Leih et al., 2015; Tariq et al., 2017; Teece, 2018a). Nonetheless, different research studies based on RBV have so far been unable to determine how companies maintain competitive advantages using resources and capabilities. Most works have focused on resources, while the use of green innovation capabilities (GIC) has been little studied (Tariq et al., 2017), even though firms that opt for GPI need new capabilities to coherently face the rigors inherent in environmental sustainability (Mellett et al., 2018; Mousavi and Bossink, 2018).

Such capabilities, in turn, impact on the business design and operation of firms and demand the support of the organizational dimensions (OD), given that they are interdependent (Teece, 2018a). There may therefore be complementary and interrelated effects between GIC and the organizational driving forces involved in environmental matters, directed towards the promotion of proactive corporate environmental practices (Bowen et al., 2001; Rodriguez and Wiengarten, 2017). In view of all the above, the organizational capabilities and dimensions through which innovation can be managed should be analysed to understand the determinants in pursuit of GPI at the organizational level.

Firms have become increasingly interested in gaining a greater understanding of the notion of innovation capabilities (IC) related to environmental sustainability. Several studies from different areas of knowledge and application fields have been developed, especially in the productive sector (Amores-Salvadó et al., 2015; Ardyan et al., 2017; Dangelico et al., 2016; Fan et al., 2017; Fernando et al., 2019; Gao and Zhang, 2013; Joo et al., 2018; Lin et al., 2011; Liu and Gong, 2018; Mellett et al., 2018; Ramanathan et al., 2018; Saenz and Atoche-Kong, 2014; Wang and Zhang, 2018; Wu, 2014; Wu and Hu, 2015; Xu and Wang, 2018). However, to the best of the authors' knowledge, none of the research papers have constructed GIC or studied them under strategic functional skills and pillars directed towards the creation of GPI which, together with OD, can lead the organization to respond to the identified determinants.

Therefore, this study integrates the analysis of GIC and OD as a solution that could serve as a systemic approach to implementing the determinants of GPI. In addition, the research aims to intervene in the structuring of the IC functional approach with theories concerning green-oriented OD and associated with determinants that can direct the organization towards innovation management to generate GPI. This solution means strategically configuring the GIC, OD, and determinants to form a system of interrelated elements leading to GPI creation, which will show how they are interconnected and complement each other under a conceptual framework that favors GPI development for the purpose of improving firms' economic, social, and environmental performance.

This approach aims to provide solutions to reduce environmental impacts from a corporate perspective among manufacturing firms. Hence, the purpose of this paper, which has a conceptual focus, is to answer the following research questions: (1) what are the constitutive determinants of GPI? and (2) What is the configuration of the GIC, OD, and determinants in pursuit of GPI?

This paper is structured as follows. Section two provides a theoretical background, section three describes the methodology, section four presents the results, section five contains the discussions, and last section six presents the conclusions, limitations, and future lines of work.

2. Theoretical background

2.1. Green innovation capabilities

In line with theoretical postulations, GIC characterization starts from the concept of resources and capabilities and continues with organizational and management capabilities towards dynamic capabilities, from where it moves towards IC with extension to the green approach. Capability refers to the ability, faculty, strength, or power to do something in light of the proposed objectives (Renard and St-amant, 2003), where strategic management is key to adapting, integrating, and reconfiguring these capabilities into the organization (Teece et al., 1997). Strategy entails organizational and management capabilities that enable a firm's resources to be mobilized, commanded, and exploited to achieve its strategic objectives (OECD/Eurostat, 2018). These capabilities reflect the interactions between resources and capabilities, which are constantly evolving and framed in systemic properties (Renard and St-amant, 2003; Teece, 2018b). As an interrelated and dynamic system, an organization is under constant evolution and adaptation, for which it requires certain capabilities. This is where Dynamic Capability (DC), a particular type of organizational capability, comes into play (Renard and St-amant, 2003). DC enables opportunities to be detected and configured, and the company's assets to be reconfigured (Teece, 2007, 2018a). At the same time, DC acknowledges the importance of innovation, facilitating the ability of organizations to produce new products in a more natural way and using a systemic approach (Teece, 2018b). Consequently, DC involves diversification and change, leading to the IC concept. According to Lahovnik and Breznik (2014), IC are acknowledged as the most relevant type of DC, enabling a competitive edge to be built and maintained.

For Burgelman, Maidique and Wheelwright (2004), IC are an integral set of characteristics which support and make an organization's technological innovation strategies flexible. IC are the organizational capabilities needed to consolidate innovation (Serrano-García et al., 2017; Serrano-García and Robledo-Velásquez, 2013a). According to Guan and Ma (2003) and Adler and Sbenbar (1990), IC allow new products to be created and processing and manufacturing technologies to be adopted, thus satisfying the current and future needs of the market. It is recommended that IC are defined in organizational levels to meet strategic needs and to adapt to environmental conditions (Guan et al., 2006).

An IC extension is the green approach (Mellett et al., 2018). In this regard, GIC[1] provide the industry with an opportunity to improve its ecological efficiency (Jakhar et al., 2019), linking the firm's environmental sustainability initiative with its performance through strategies designed for this purpose (Kim et al., 2018). The development of higher levels of GIC helps organizations to elucidate processes, techniques, and products to reduce environmental damage (Tseng et al., 2019) since it facilitates their understanding and discernment of the specific aspects to be adapted and improved. GIC empower the organization to comply with environmental requirements and to become part of the emerging green economy (Mellett et al., 2018).

Thus, GIC are regarded as alternatives that support organizations to meet current ecological needs. From this, it may be inferred that GIC comprise organizational and dynamic capabilities that could foster GPI development and respond to the environmental sustainability challenge. Characterizing the term GIC, capability can be represented as an organization's ability to become immersed in a green-oriented strategy; innovation, as an approach to change, evolve, and/or adapt to the green mindset; technology, as the tacit approach within innovation and the implicit and explicit knowledge contained in solutions to environmental problems; and last, the green approach, as the organization's involvement and commitment to environmental care. Corporate, business and functional units could be required to focus on a specific set of strategic green capabilities for the success of an organization regarding environmental practices aimed at creating ecological value.

2.2. Organizational dimensions for GPI

The existence and survival of an organization depend on its performance and response to the requirements of its environment (Chiavenato, 2006). To this effect, the organization identifies the need to meet different challenges, among which are social responsibility, ethical issues and the demands of the environment, to be integrated as opportunities in their business design (Bocken et al., 2016; Robbins and Coulter, 2014; Weerts et al., 2018). One essential requirement may be the identification and creation of an architecture in the context of environmental demands, given the affectations triggered by different polluting factors. This paves the way for the need to strategically link the organization's response capacity and adaptation to the required adjustments (Chiavenato, 2006; Nadler et al., 2011). Managers need to reflect on and redesign the organization, seeking to be competent in response to changing conditions (Teece, 2018a; Volberda, 1999). To this effect, the design of the business model is considered an inherent part of meeting the company's stated objectives (Foss and Saebi, 2015). The role of the design is to coordinate and control the OD to guarantee organizational development (Patrucco et al., 2019). The OD, then, can be postulated in line with the business model and design and with the organizational and personified challenges in the institutional task, making organizations unique and distinct. The dimensions can facilitate the structure and stimulate the organization to improve the processes that facilitate innovation of their goods and/or services (Galbraith, 1982; Teece, 2018b), favouring the capture, value delivery, and compliance with the conditions required by the environment (Chiavenato, 2006; Fjeldstad and Snow, 2018; Jaspers et al., 2012).

In this regard, OD are a strategic point that enables value proposition activities and pragmatically supports evolution operations, thus allowing a process transformation for the generation of value in the community (Foss and Saebi, 2015; Huijben et al., 2016). This is how organizations may be considered to be a set of organizational dimensions, components, and/or elements (Huijben et al., 2016; Nadler and Tushman, 1980; Patrucco et al., 2019) that represent the organizational design differentiation. OD may help to reduce complex phenomena and foster articulation within the organization in accordance with managerial needs when defining strategies (Daft, 2011; Nadler and Tushman, 1980) that impact GPI facilitation at the organizational level.

Within organizational design, OD may comprise both formal and informal organizational structures for the transformation of processes and results (Nadler et al., 2011) directed at the environmental approach, leading to the generation of green innovation (Herrera-Baltazar, 2015; Liao and Tsai, 2019). Nevertheless, "at this point in the development of a science of organizations, we probably do not know the one right or best way to describe the different components of an organization" (Nadler and Tushman, 1980, p. 43) or, notably, to develop GPI, due to the different organizational challenges firms face.

The task could be to identify the OD that are adaptable to new environmental demands and help to strategically describe organizations advocating GPI development (Bhaskar and Mishra, 2017; Lin et al., 2011; Nadler et al., 2011), given that innovation requires a specifically designed organization (Galbraith, 1982; Song et al., 2018) where organizational dimensions, structures, and processes act as previous and enabling requirements of innovation (Armbruster et al., 2008).

3. Methodology

To answer the research questions posed in this study, the methodology implemented here is intended to identify the determinants of GPI, GIC, and OD, and then reconfigure them into an innovation management framework that will serve as a proposal for organizations to deal with GPI. The stages outlined below are derived from the methodological designs proposed by Bolden et al. (1997) and Edison et al. (2013).

3.1. Stage 1. Search and selection of studies related to the determinants of GPI

Two specialized databases, Scopus and Web of Science, were used in the search for publications, which was limited to works published between 2005 and 2020 because a clear research trend into GPI is observed in this period. A search equation that ensured a consistent and comparable search in the two databases was designed using the following keywords: driver, determinant, ecological product, environment, factor, friendly product, green product innovation, and practice responsive product.

The studies were selected based on the following inclusion criteria: (i) language: works and/or literature reviews originally published in English; (ii) document availability; and (iii) topic: articles that debate or provide a definition of GPI; papers that include determinants, drivers, factors or practices affecting GPI development at the organizational level; and publications that present, list, or integrate determinants under conceptual frameworks in manufacturing firms, excluding those that propose frameworks as instruments to measure and validate their concepts and connections.

Of the 1174 papers retrieved from the initial search, only 38 met the inclusion criteria. These articles served as the basis to generate the results and discussions on the determinants of GPI and the development of the concept. Following Khan et al. (2021), the diagram in Fig. 1 summarizes the process described above.

3.2. Stage 2. Identification and categorization of the determinants of GPI

The 38 selected articles were analysed to identify the determinants, drivers, factors, and practices presented by the authors as elements leading to GPI. This identification is justified by the fact that these determinants are key attributes to achieve GPI. Once identified, these determinants were classified and grouped according to various aspects such as similarity in their meaning and purpose, technical and physical characteristics, and impact on the different organizational areas. This

[1] Although in the literature, "IC" and "TIC" are frequently used to refer to a similar set of capabilities and are considered equivalent terms, here "IC" will mostly be used to allude to innovation capabilities, in accordance with the terminology defined in the Oslo Manual 2018 (OECD/Eurostat, 2018).

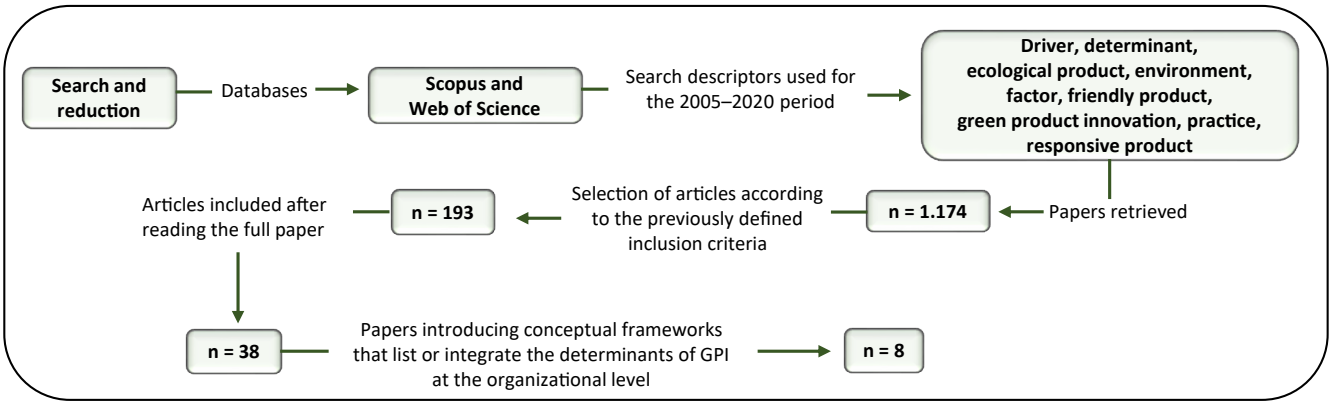

Fig. 1. Search and reduction of the determinants of GPI.
Source: Authors' elaboration

categorization is considered to help direct and reconfigure the organization to meet current demands regarding GPI.

3.3. Stage 3. Formulation of GIC and OD to steer organizations towards GPI

Finding a way to respond to the identified sets of determinants of GPI at the organizational level was a challenging task. According to this study, organizations would need to structure GIC and OD under an innovation management approach to meet this innovative challenge. This is in line with the works of Robledo-Velásquez (2019), Robledo--Velásquez et al. (2011), Serrano-García and Robledo-Velásquez (2013a), Serrano-García et al. (2017), which are based on the results of Guan and Ma (2003), Yam et al. (2004) and Wang et al. (2008), who proposed and evaluated seven IC, and also on the theoretical foundations of the OD proposed by Nadler and Tushman (1997), and the variant presented by Gouel (2005) in support of the transformation processes of firms.

In accordance with the studies mentioned above and the identified sets of determinants, this study proposes extending seven GIC to GPI as a possible strategic form of organizational reconfiguration. Furthermore, since the configuration of OD depends on the context and the stages of organizational development (Nadler et al., 2011), this work proposes five OD that are superimposed on the environmental context while keeping correspondence with the proposal of (Gouel, 2005; Nadler and Tushman, 1997). The selection of these OD is supported by previous research into different OD in the field of environmental sustainability, potentially helping to satisfy the current need for organizational reconfiguration considering the identified sets of determinants that favor GPI.

3.4. Stage 4. Defining GPI under an innovation management approach

The 38 selected articles included different definitions of GPI in technical, physical, and environmental areas, for instance, but not in the field of organizational management. This is explained by the fact that this concept is new and currently under development (Jasti et al., 2015; Sdrolia and Zarotiadis, 2019). Consequently, this study presents the proposal in relation to the understanding, description, and development of a GPI depending on the sets of determinants, GIC and OD, to characterize it within the field of business administration and innovation.

3.5. ***Stage 5.*** *Framework: taxonomy and matrix* ***of the determinants of GIC and OD***

Since the determinants of GPI involve different organizational skills and areas, the next step was to establish how these determinants could be affecting firms in terms of GPI development. Therefore, the impact of these determinants on each of the proposed GIC and OD was analysed, based on the theoretical and conceptual approach and together with the sets of categorized determinants. The result was a taxonomy and matrix framework. The first (taxonomy) clearly relates and defines the determinants of GPI within the different GIC and OD, establishing a comprehensive relationship that explains how the sets of identified determinants impact a given capability or dimension, or combinations of both, within organizations. The second (matrix) operationalizes the relationship between determinants, GIC and OD, and allows the organization to coherently and relationally define variables (activities) to assess its innovation management model in terms of GPI development.

The configuration of the taxonomy was carried out by each author considering their knowledge and experience in the area or research, after which a consensus was reached regarding their shared classification. Last, the taxonomy derived was refined by three business experts in green strategy and product innovation. The following factors were taken into consideration during this process: the theoretical and conceptual focus of each of the sets of determinants; the scope of the descriptions of the GIC, and the arguments of the OD; the theoretical referents upon which the organization's capacities and key components to develop green products were set forth; and the related key determinants to achieve this.

4. Results

The results obtained with the methodology implemented to address the research questions posed in this study are presented below.

4.1. Determinants of GPI

The determinants of GPI correspond to the antecedents, factors, drivers, and practices considered by the authors as key components leading to and preceding the development of GPI (Chen and Chang, 2013; Tariq et al., 2017). From the literature review, 266 proxies were found and grouped into 22 sets. Table 1 is an example of one of these sets of determinants and includes the source, proxys, a brief description of the set, and its concise name. In this specific case, the proxies are related to aspects such as energy, materials, waste, and reuse and are grouped into the reduced and efficient use of inputs and raw materials to achieve the GPI category. The process of identifying and grouping the 22 sets of determinants and their corresponding sources is presented in Table 4.

4.2. Adaptation and definition of seven new GIC under the green approach

According to Joo et al. (2018, p. 6094) "*the firm's environmental sustainability cannot be fully achieved without increasing technological*

Table 1
Sample of a set of determinants.

Authors	Proxys	Brief description	Determinant
Albino et al. (2009)	Material eco-efficiency	Intelligent use of resources, represented in the use of eco-efficient materials, their reuse and remanufacture, and the recycling of raw materials and consumables, impacting on the reduction of costs and favouring the creation of GPI.	Intelligent use of resources
Albino et al. (2009)	Energy efficiency		
Dangelico and Pujari (2010)	Reduced energy consumption		
Dangelico and Pujari (2010)	Reduced material use		
Chung and Wee (2010)	Smart use of resources		
Chung and Wee (2010)	Reuse, remanufacturing, and recycling of used products		
Chan et al. (2013)	Decisions regarding the type of raw materials, packaging, means of transport, and disposal		
Dangelico (2017)	Reduced costs, energy consumption, and material use to develop more innovative green products		
Tariq et al. (2017)	Reduced use of valuable input resources		
Zhang and Li (2019)	Low impact of renewable materials, recyclable materials, non-polluting materials, materials with low-energy content		

Source: Authors' elaboration.

innovation capabilities". Therefore, it is essential to understand, create, and protect these capabilities in agreement with the organization, its strategic plans, and the demands of its environment (Serrano-García and Robledo-Velásquez, 2013b).

In line with the definitions stated mainly in Dangelico et al. (2016), Hart (1995), Hart and Dowell (2011), Teece et al. (1997), Robledo-Velásquez et al. (2011), Serrano-García and Robledo-Velásquez, 2013a, and Serrano-García et al. (2017) and the theoretical background presented in this paper regarding GIC, and in accordance with the identified sets of determinants, for the purpose of the present paper GIC are understood as *organizational and dynamic abilities built and/or acquired by an organization in accordance with its strategic and operational management and aimed at developing GPI and contributing to solving the environmental challenges. GIC must be identified and integrated into each organizational function to respond to the new demands or necessary improvements within the context of GPI development. As a result, this would help firms to reduce and/or eliminate the pollution they cause, thus gaining comparative and competitive advantages.*

By extending this to the sphere of organizational functions, a proposal to select, adapt, and define the seven new GIC aimed at GPI development is presented in this study. Each GIC details the specific skills that organizations may need to reconfigure their capabilities to make progress in terms of innovation management, fostering the creation, development, and marketing of sustainable technological innovations to support firms' comparative and competitive advantage. Table 2 contains the name of the capability, the proposed definition, examples of responses, and relevant references.

4.3. OD identification and selection for GPI

Companies could strategically reconfigure the following OD: organizational behavior, human talent management, technology, environmental social responsibility, and environmental regulation. There are several other OD that organizations might consider. However, the proposed OD are based on Gouel (2005), Nadler and Tushman (1980), and Nadler et al. (2011), but updated in light of organizational needs to manage innovation to achieve GPI triggers to benefit environmental sustainability. Seeking to respond to the challenges currently faced by companies developing GPI, definitions and characteristics of OD are given below.

4.3.1. Human resources (HR)

Firms are made up of key elements to achieve profitability. One such element is human resources which, according to Chiavenato (2009), "are beings endowed with intelligence, knowledge, abilities, personality, aspirations, and perceptions, among others" (translation of the original in Spanish on p. 9).

In the context of compliance with environmental sustainability at the corporate level, HR Management is seen as a powerful area because of its strength and contribution (Chams and García-Blandón, 2019; Pellegrini et al., 2018) to achieving the organizational objectives. In recent times, this area has undergone several adjustments to meet firms' current needs. In the words of Kramar (2014), "sustainable HRM could be defined as the pattern of planned or emerging HR strategies and practices intended to enable the achievement of financial, social and ecological goals while simultaneously reproducing the HR base over a long term" (p. 1084). This area also includes actions and regulations that support greening activities (Jackson et al., 2014). According to Yong et al. (2019), researchers suggest that this new scope may facilitate the transition towards sustainability by implementing a clear structure in the different stages (integration, organization, retention, development, and audit (Chiavenato, 2009)), aimed at achieving environmental sustainability. For this purpose, interconnection between organizational functions, capabilities, and the environment is needed (Kramar, 2014).

4.3.2. Organizational behavior (OB)

Attitudes that safeguard individuals, groups, and organizations, supported by culture, motivation, leadership, change, and teamwork as independent factors that influence the action (Robbins and Judge, 2009). Therefore, a large number of individuals should become involved in coordinated actions to explore and execute activities to weaken or annihilate the impacts of organizations on climate change and other environmental problems (Geiger et al., 2019). The findings of Pellegrini et al. (2018) indicate that when organizations express their commitment to and promotion of sustainability, their members orient their efforts and behaviors to achieve this goal. Therefore, through their attitudes, convictions, and motivation, all members must work in favor of GPI development.

4.3.3. Technology (T)

Organizations need a technological basis to achieve their strategic and operational objectives. However, it should be noted that technology is not exclusively limited to the concept of hardware (i.e., artifacts and machines) (Robledo-Velásquez, 2019), but also includes a set of information which, once organized, becomes knowledge represented in practices, experiences, skills, devices, technical methods, and systems (OECD/Eurostat, 2018; Robledo-Velásquez, 2019) that promote its application to transform functional and organizational characteristics.

Therefore, given the current environmental demands and seeking to satisfy and attract new customers, an alternative could be to propose and adopt new green knowledge and technologies in product development manufacturing (Lisi et al., 2019). This includes appropriate knowledge in the area of technology innovation and represented in "energy-saving, pollution-prevention, waste recycling, green product designs, or corporate environmental management" (Chen et al., 2006, p. 332), requiring organizational support in terms of structure and strategy (Adler and Sbenbar, 1990). Consequently, by combining technology,

Table 2
Adaptation and definition of seven new GIC.

Capability	Definition	Examples	References
GSPC: Green strategic planning capability	*Firms' abilities to define prospects, policies, programs, plans, and objectives to avoid, improve, and/or replace the use of nonrenewable materials (toxic materials) with cleaner resources and technologies, under a comprehensive approach and throughout the product's life cycle. Likewise, to promote composting, reuse, and recycling, thus preventing environmental pollution and fostering GPI development.*	• Green management programs and philosophy. • Guidelines for GPI development. • Organizational policies, plans, and objectives oriented towards environmental sustainability. • Planning of environmental activities and projects. • Programs regarding changes in the design, incubation, and development of green products.	(Guan and Ma, 2003), (Yam et al., 2004), (Robledo-Velásquez et al., 2011), (Serrano-García and Robledo-Velásquez, 2013a), (Hart, 1995), (Block and Marash, 2002), (Ulrich and Eppinger, 2012), (Berry and Randinelli, 1998), (Prakash, 2000), (Ludevid, 2000), and (Dangelico and Pujari, 2010).
GOIC: Green organizational innovation capability	*Abilities defined in firms' business design and model, processes, management, and organizational and commercial structure. They focus on the assimilation, application, and acquisition of competencies to address new environmental opportunities and promote systemic capacity for GPI development.*	• Organizational values oriented towards environmental sustainability. • Management and staff's commitment to GPI development. • Green business model. • Management of radical and incremental innovation in environmental sustainability. • Coordination among and motivation of functional groups to design and develop green products.	(Yam et al., 2004), (Guan and Ma, 2003), (OECD/Eurostat, 2018), (Hart, 1995), (Van Hoof, 2014), (Dangelico et al., 2016), (Vickers and Cordey-Hayes, 1999), (Dangelico and Pujari, 2010), and (Wee and Quazi, 2005).
GR&DC: Green R&D capability	*Firms' abilities to create ideas, design prototypes, and develop technologies focused on reducing and/or eliminating the use of toxic resources and fostering the employment of eco-efficient materials and clean technologies, remanufacturing, and recycling, thus favouring the development of a new or improved green product.*	• R&D approach from the very design to the development of the green product prototype. • R&D activities to avoid the use of toxic materials in production. • R&D activities to create eco-friendly packaging and labels. • R&D activities to favor composting and/or recycling of containers and packaging.	(Guan and Ma, 2003), (Yam et al., 2004), (OCDE, 2015), (Leonidou et al., 2013), (Chung and Wee, 2010), and (Albino et al., 2009).
GPC: Green production capability	*Firms' abilities to develop and manufacture GPI based on stakeholders' needs and R&D results aimed at preventing the generation of waste, minimizing the use of materials and inputs, and fostering the employment of eco-efficient materials and waste reuse.*	• Changes in and optimization of the resources used. • Sustainability of resources used in production. • Production inputs and healthy outputs. • Recycling and reuse of materials in production. • Safety, hygiene, and maintenance of local production machines and premises, generating the minimum waste. • Design of ecological processes.	(Guan and Ma, 2003), (Yam et al., 2004), (Robledo-Velásquez et al., 2011), (Serrano-García and Robledo-Velásquez, 2013a), (Hart, 1995), (Ulrich and Eppinger, 2012), (Block and Marash, 2002), and (Dangelico and Pujari, 2010).
GOLRC: Green organizational learning and relationship capability	*Firms' abilities to learn about environmental sustainability with a focus on cleaner design, production, and packaging; remanufacturing; and recycling, among other aspects, through the collaboration of and continuous relationship with their stakeholders to improve their organizational actions and favor GPI development.*	• Participation of suppliers, customers, and the community in GPI development. • Brainstorming and exchange of information, techniques, and experiences with governments and/or nongovernmental organizations (NGOs) to learn about environmental solutions. • Organizational learning programs for compliance with environmental regulations.	(Yam et al., 2004), (Guan and Ma, 2003), (Yang, 2019), (Shevchenko et al., 2016), (Hart, 1995), (Nonaka, 1994), (Van Hoof, 2014), (Vickers and Cordey-Hayes, 1999), (Block and Marash, 2002), and (Albort-Morant et al., 2016).
GRMC: Green resource management capability	*Firms' abilities aimed at appropriately managing, obtaining, and allocating resources to implement R&D activities, thus favoring the invention of green products, the search and classification of ecological suppliers, the hiring of expert staff, the creation of learning and motivation programs concerning top environmental IC. Equally, the purchase of clean technologies and different inputs for production, the use of eco-friendly packaging, the identification of distribution channels, and recycling and potential remanufacturing, which, in turn, boosts the development and consolidation of GPI.*	• Strategic alliances between companies in the same sector for purchasing environmentally harmless inputs. • Negotiation agreements with suppliers certified in sustainability for the supply of raw materials. • Resource management for learning about and complying with environmental regulations. • Resource management for creating programs that foster the remanufacturing, recycling, and/or composting of products.	(Guan and Ma, 2003), (Yam et al., 2004), (Vickers and Cordey-Hayes, 1999), (Hart, 1995), (Serrano-García and Robledo-Velásquez, 2013a), (Block and Marash, 2002), (Chung and Wee, 2010), (Ludevid, 2000), (Chkanikova, 2016), and (Lee and Kim, 2011).
GMC: Green marketing capability	*Firms' abilities to redesign, publicize, and deliver products with a value offer based on environmental sustainability through using packaging, containers, and distribution channels that reduce and/or replace the use of nonrenewable resources (toxic resources) with light and/or recycled materials and components that can be reused and/or composted, thus facilitating the delivery of GPI to customers and consumers.*	• Availability of products with higher quality and preservation properties. • Offerings of products and packaging with reduced and/or zero harmful effects. • Product packaging that can be reused and recycled. • Final products' compliance with the ecological standards demanded by customers and consumers.	(Yam et al., 2004), (Guan and Ma, 2003), (OECD/Eurostat, 2005), (Prakash, 2000), (Vickers and Cordey-Hayes, 1999), (Ludevid, 2000), (Tsai, 2012), (Lin and Huang, 2012), and (Spack et al., 2012).

Source: Authors' elaboration.

innovation, and organizational systemic techniques under the green philosophy, improved products could be developed to satisfy the current needs of society and the environment (Jabbour et al., 2015).

4.3.4. Corporate environmental responsibility (CER)

This approach is built upon social responsibility, which refers to the actions taken by firms for the benefit of their stakeholders, represented in their economic, legal, ethical, and philanthropic commitments (Archie and Carroll, 1991). This approach also currently encompasses environmental social responsibility (Siegel, 2009), which is carried out under socially responsible strategies that seek to adequately satisfy the pressures of protecting the environment (López-Cabarcos et al., 2019). and lead to the development of green products, among other actions. Organizations must have the required capabilities to evaluate this behavior (Siegel, 2009) based on an articulated system that provides them with adequate support.

4.3.5. Environmental regulation (ER)

Compliance with environmental regulations—which have been of paramount importance for decades—is a dynamic aspect needed for GPI development. To this effect, regulations force companies to implement ecological measures that favor the creation of GPI, thereby avoiding sanctions for non-compliance (Foo et al., 2019). Therefore, the environmental rules serve to make organizations realise and be aware of the environmental harm they are causing (Pérez-Pérez et al., 2021). As visionaries, Porter and Van der Linde (1995) presented their hypothesis on how firms can respond to market needs in an eco-friendly way and how complying with environmental standards can become an extraordinary competitive advantage for them.

According to Majumdar and Marcus (2001), such regulations are classified as flexible and inflexible. Flexible regulations are willingly adopted by firms, based on their motivation and level of commitment to care for the environment, resulting in product innovation and compliance with environmental obligations. Inflexible regulations, on the other hand, include manuals and exact provisions that stifle innovation but fight against pollution. According to the results of Ramanathan et al. (2017), flexible regulations favor imagination, creation, and innovation within organizations, and are also essential as they can increase competitiveness at the industry level (Porter and Van der Linde, 1995). Hence, depending on the firms' appropriation of IC, they may be able to assimilate and respond to environmental regulations by developing transformative solutions such as, in this case, GPI development, thus impacting on their economic profit (Saenz and Atoche-Kong, 2014).

4.4. Definition of GPI based on GIC, OD, and its determinants

Developing GPI is an opportunity for manufacturing firms to protect the environment due to their reduced environmental impacts. This alternative also favors firms' market share and comparative and competitive advantage (Lee and Kim, 2011; Tsai, 2012). Based on these assertions, Table 3 contains a sample of definitions of a green product (GP) and GPI.

This table clearly shows that there are different definitions of GPI and there is no consensus on a globally accepted one for the general concept of green products (Sdrolia and Zarotiadis, 2019). "Being an entirely new industry, the designations 'green product 'or 'environmentally conscious product' cover a wide variety of different products with their own distinct characteristics"(Tsai, 2012) (p. 117). However, all the definitions seem to have the same purpose: to reduce and/or eliminate the environmental impacts generated by products that supposedly improve quality of life.

According to the systematic review of the literature in Sdrolia and Zarotiadis (2019), GPI is given different names such as "environmentally conscious product", "environmental product", "ecological product", "environmentally correct" or "environmentally sustainable product", "eco-product", "green product", or "sustainable product."

Table 3
GP and GPI definitions.

Authors	GP and GPI definitions
Albino et al. (2009)	A 'green product' is referred to as a product designed to minimize its environmental impacts during its whole life cycle.
Huang and Wu (2010)	Green new product success as the ability of a green new product or innovation to compete in the marketplace.
Dangelico and Pujari (2010)	Green product innovation is a multi-faceted process wherein three key types of environmental focus – material, energy, and pollution – are highlighted based on their major impact on the environment at different stages of the product's physical life cycle – manufacturing process, product use, and disposal. It is important to note that not all products have a significant environmental footprint at each stage of the physical product life cycle, and nor does the footprint stem from all aspects (material, energy, and pollution). However, almost all products have a significant environmental impact in at least one of the stages.
Lee and Kim (2011)	Green product innovation as a multi-faceted process aimed at minimizing environmental impacts while striving to protect and enhance the natural environment by conserving energy and resources.
Tsai (2012)	Green products are classified into the following seven categories based on the discussion of Grave (1992), Peattie (1992), Makower et al. (1993), Simon (1971), and Chen (2001): 1. It must be Environmental Protection Certified by the government. 2. It must use fewer raw materials or be readily recyclable. 3. It must be harmless to animal and plant life or produce less pollution. 4. It must be capable of being repeatedly used, replenished or sustainable. 5. Its operation must consume less energy. 6. It must possess a function to reduce pollution. 7. Its manufacturing process must produce less pollution.
Zhang and Li (2019)	Green products are the kind of products that are designed in such a way as to have the least environmental impact during their production and consumption.
Sdrolia and Zarotiadis (2019)	Green is a product (tangible or intangible) that minimizes its environmental impact (direct and indirect) during its whole life cycle, subject to the present technological and scientific status.
Long and Liao (2021)	Eco-product innovation exerts the most significant influence on sustainability because it aims to reduce resource use and pollution throughout the entire product life cycle, from product design to disposal.

Source: Authors' elaboration.

Based on these definitions of GPI and the sets of identified determinants, the GIC descriptions, and the OD arguments, and for the purpose of the present paper, what follows is the proposal regarding the understanding, description, and development of a GPI:

It is understood that the scope of green product innovation could represent a corporate commitment where a product is designed, created, produced, and traded with reduced or zero pollution or using non-renewable materials and light packaging. In addition, this commitment would encourage consumers and firms to recycle and reuse it. Development could require new innovation performance directed towards reconfiguring and strengthening the seven GIC and the five OD for GPI. In addition, it requires a systemic approach that enables the orchestration of the corporate ecosystem and contributes to the generation of value, corporate profits, community satisfaction, and the environment.

4.5. Framework: taxonomy and matrix

What follows is the framework, which is made up of two elements. The taxonomy, which is where the determinants of GPI in GIC and OD are located, and the matrix, which operationalizes the taxonomy.

Table 4
Taxonomy of determinants in GIC and OD.

#	Authors	Brief description	Determinant	Green Innovation Capabilities (GIC)							Organizational Dimensions (OD)				
				GSPC	*GOIC*	*GR&DC*	*GPC*	*GOLRC*	*GRC*	*GMC*	*HR*	*OB*	*T*	*CER*	*ER*
A	(Albino et al., 2009), (Janine Fleth De Medeiros et al., 2018), (Leonidou et al., 2013), (Alharthey, 2019), (Dangelico, 2017), (Dangelico, 2016), (Lin and Huang, 2012), (Huang et al., 2016), (Jasti et al., 2015), (Ilg, 2019), (Dangelico and Pujari, 2010), and (Melander, 2017).	Formulation and implementation of short-, medium- and long-term policies, mission, programmes, strategies, and organizational objectives, aims and goals in procuring GPI.	Planning oriented at GPI	***GSPC***							***HR***			***CER***	
B.	(Huang and Wu, 2010), (Wee and Quazi, 2005), (El-Kassar and Singh, 2019), (Dangelico, 2017), (Melander, 2017), and (Tariq et al., 2017).	Philosophies, organizational commitment, identity, culture, and corporate environmental ethic leading to environmental management practices.	Corporate green commitment	***GSPC***	***GOIC***						***HR***	***OB***		***CER***	
C.	(Albino et al., 2009), (Jasti et al., 2015), (Lee and Kim, 2011), and (Tsai, 2012).	Planning, design, development, and control of green processes and products.	Design of green processes and products	***GSPC***		***GR&DC***	***GPC***		***GRC***				***T***	***CER***	***ER***
D.	(Dangelico and Pujari, 2010), (Chung and Wee, 2010), (Lee and Kim, 2011), (Tsai, 2012), (Wee and Quazi, 2005), (Chan et al., 2013), (Jasti et al., 2015), (Dangelico, 2017), and (Oliveira et al., 2018)	Organizational management in the supply chain, administrative and structural support in procuring the generation and adoption of green innovation, facilitating compliance with environmental regulations and social responsibility.	Organizational management directed at green innovation		***GOIC***		***GPC***	***GOLRC***		***GMC***		***OB***		***CER***	*ER*
E.	(Huang et al., 2016), (Jasti et al., 2015), and (Tariq et al., 2017).	Development and implementation of a certified environmental management system.	Environmental management system	***GSPC***	***GOIC***		GPC		GRC				T	***CER***	***ER***
F.	(Albino et al., 2009), (Dangelico and Pujari, 2010), (Chung and Wee, 2010), (Tsai, 2012), (Tariq et al., 2019), (Zhang and Li, 2019), (Jabbour et al., 2015), and (Berchicci and Bodewes, 2005), (Tsai, 2012), (Tariq et al., 2019), (Song et al., 2018), (Chen and Chang, 2013), and (Jabbour et al., 2015).	Manufacturing under the incorporation of practices for improving production and optimising processes, and for incorporating environmental attributes such as recyclable material, the use of eco efficient and less toxic material, the reuse and remanufacture of raw materials, using less quantity of resources, and/or eliminating contamination in procuring GPI.	Manufacturing under the incorporation of environmental practices and attributes			***GR&DC***	***GPC***		***GRC***				***T***	***CER***	***ER***
G.	(Tsai, 2012), (Leonidou et al., 2013), (Dost et al., 2019), (Tariq et al., 2019), (Janine Fleth	Development and use of green techniques and technologies that prevent pollution for the creation,	Development of environmental technologies		***GOIC***	***GR&DC***	***GPC***						***T***	***CER***	*ER*

(*continued on next page*)

Table 4 (*continued*)

#	Authors	Brief description	Determinant	Green Innovation Capabilities (GIC)							Organizational Dimensions (OD)				
				GSPC	*GOIC*	*GR&DC*	*GPC*	*GOLRC*	*GRC*	*GMC*	*HR*	*OB*	*T*	*CER*	*ER*
	De Medeiros et al., 2018), (Janine Fleith De Medeiros et al., 2018), (Dangelico, 2017), (Berchicci and Bodewes, 2005), (Tariq et al., 2017), and (Chen and Chang, 2013).	manufacturing, distribution, and end-of-life of green new products.													
H.	(Dangelico and Pujari, 2010), (Cheung and To, 2019), (Alharthey, 2019), (ShabbirHusain and Varshney, 2019), (Spack et al., 2012), and (Tan et al., 2019).	Credible advertising on communication platforms, showing the characteristic and environmental benefits of the green products offered by the firm.	Evidential advertising of GPI		***GOIC***			***GOLRC***		***GMC***			***T***		
I.	(Spack et al., 2012), (Leonidou et al., 2013), (Tan et al., 2019), (Chan et al., 2013), (Tariq et al., 2019), (Zhang and Li, 2019), and (Alharthey, 2019).	Lighter, cleaner, and more environmentally friendly product packaging that can be recycled or reused and/or can easily decompose.	Packing, packaging, and green labelling			***GR&DC***	***GPC***		***GRC***	***GMC***			***T***	***CER***	***ER***
J.	(Lin and Huang, 2012), (Tsai, 2012), (Leonidou et al., 2013), (Tan et al., 2019), (Yogananda and Nair, 2019), (Melander, 2017), (Alharthey, 2019), (Melander, 2018), (De Medeiros et al., 2014), (Janine Fleith De Medeiros et al., 2018), (De Medeiros et al., 2014), (Tariq et al., 2017), and (Cheung and To, 2019).	The demands and preferences of clients and consumers in terms of protecting the environment must be present and be complied with throughout the design, manufacturing, and distribution stages.	Customer demand	***GSPC***		***GR&DC***	***GPC***	***GOLRC***		***GMC***				***CER***	ER
K.	(Janine Fleth De Medeiros et al., 2018)	Market monitoring after product launch to assess consumers' satisfaction.	Monitoring the market							***GMC***	***HR***		***T***		
L.	(Huang and Wu, 2010), (Tsai, 2012), (Chen and Chang, 2013), and (Janine Fleith De Medeiros et al., 2018), (Tariq et al., 2017), (Berchicci and Bodewes, 2005), (Dangelico, 2016), (Dost et al., 2019), (Wee and Quazi, 2005), (Chan et al., 2013), and (Dangelico and Pujari, 2010).	R&D directed at green product innovation under the generation and implementation of original, novel, useful ideas in the whole of the product lifestyle.	R&D directed at GPI		***GOIC***	***GR&DC***	***GPC***	***GOLRC***				***OB***	***T***		***ER***
M.	(Albino et al., 2009), (Dangelico and Pujari, 2010), (Chung and Wee, 2010), (Chan et al., 2013), (Tariq et al., 2019), and (Zhang and Li, 2019).	Intelligent use of resources represented in the implementation of eco efficient materials, reuse, remanufacturing, and the recycling of raw materials and	Intelligent use of resources	***GSPC***			***GPC***		***GRC***		***HR***	***OB***	***T***	***CER***	***ER***

(*continued on next page*)

Table 4 (*continued*)

#	Authors	Brief description	Determinant	Green Innovation Capabilities (GIC)							Organizational Dimensions (OD)				
				GSPC	*GOIC*	*GR&DC*	*GPC*	*GOLRC*	*GRC*	*GMC*	*HR*	*OB*	*T*	*CER*	*ER*
		consumables, impacting on the reduction of costs and facilitating the creation of GPI.													
N.	(Wee and Quazi, 2005), (Chan et al., 2013), (Janine Fleth De Medeiros et al., 2018), (Janine Fleith De Medeiros et al., 2018), (Song et al., 2018), (Huang et al., 2016), (Chen and Chang, 2013), (Melander, 2017), and (Berchicci and Bodewes, 2005).	Investment of resources to comply with social responsibility and environmental regulations. Investment in laboratories, in R&D, in cleaner technologies, in ecological modernization, in improvements in production systems, in infrastructure, in qualified human resources, in knowledge, in relationships, and in collective learning, aimed at supporting GPI.	Investment in resources directed at green product development	***GSPC***					***GRC***					***CER***	***ER***
O.	(Lee and Kim, 2011), (Chkanikova, 2016), (Ilg, 2019), (Melander, 2018), (Dangelico, 2016), (Melander, 2017), (Dangelico, 2017), (De Medeiros et al., 2014), and (Tariq et al., 2017).	Collaborative and communication relationships with suppliers, customers, consumers, environmental groups, universities, research institutions, and firms, among others, for the supply and use of environmentally friendly materials and the design of initiatives and developments in terms of research, innovation, technology transfer, and cleaner products and processes.	Institutional relations		***GOIC***	***GR&DC***		***GOLRC***			***HR***	***OB***	***T***		
P.	(El-Kassar and Singh, 2019), (Ilg, 2019), (ShabbirHusain and Varshney, 2019), (Oliveira et al., 2018), (Melander, 2018), (Janine Fleith De Medeiros et al., 2018), (Dangelico, 2017), (Dangelico, 2016), (Huang et al., 2016), (Melander, 2017), (De Medeiros et al., 2014), (Tariq et al., 2017), (Lee and Kim, 2011), and (Wee and Quazi, 2005).	Response capacity and knowledge acquisition, dissemination, and exchange between employees and stakeholders, reflected in the elimination of cultural barriers, quality, best environmental practices, and new materials, technologies, and resources to favor GPI.	Acquiring knowledge		***GOIC***	***GR&DC***		***GOLRC***			***HR***	***OB***	***T***		
Q.	(Janine Fleth De Medeiros et al., 2018), (Janine Fleith De Medeiros et al., 2018), (Dangelico, 2017), (	Green-oriented leadership and transformative behavior translated into corporate ethic, monitoring and	Ecological organizational leadership		***GOIC***			***GOLRC***			***HR***	***OB***			

(*continued on next page*)

Table 4 (*continued*)

#	Authors	Brief description	Determinant	Green Innovation Capabilities (GIC)							Organizational Dimensions (OD)				
				GSPC	*GOIC*	*GR&DC*	*GPC*	*GOLRC*	*GRC*	*GMC*	*HR*	*OB*	*T*	*CER*	*ER*
	Huang et al., 2016), (Chen and Chang, 2013), (De Medeiros et al., 2014), and (Tariq et al., 2017).	identification of new opportunities, cross-functional collaboration, and motivation and incentives for the development of green product offerings.													
R.	(Wee and Quazi, 2005), (El-Kassar and Singh, 2019), (Janine Fleth De Medeiros et al., 2018), (De Medeiros et al., 2014), (Tariq et al., 2017), (Chen and Chang, 2013), (Melander, 2017), (Chang, 2016), (Song et al., 2018), (Melander, 2018), and (Huang et al., 2016).	Human resources with extensive knowledge on environmental sustainability to promote the creation and alignment of teams and cross-functional procedures and their communication for GPI development.	Human talent with competences towards GPI		***GOIC***			***GOLRC***			***HR***	***OB***			
S.	(Albino et al., 2009), (Huang and Wu, 2010), (Dangelico and Pujari, 2010), (El-Kassar and Singh, 2019), (Song et al., 2018), (ShabbirHusain and Varshney, 2019), (Chen and Chang, 2013), (Jasti et al., 2015), (Tariq et al., 2017), (Chang, 2016), and (Chung and Wee, 2010).	Corporate social responsibility as a philosophy, an ethical act, and an environmental commitment that provides a sense of identity and allows firms to adapt to achieve their green objectives.	Environmental responsibility	***GSPC***	***GOIC***							***OB***		***CER***	
T.	(Huang and Wu, 2010), (Dangelico and Pujari, 2010), (Tsai, 2012), (Chan et al., 2013), (Melander, 2018), and (Huang et al., 2016).	Assessment practices, such as emission measurement, auditing, and environmental offset incentives at each stage of the product's life cycle.	Environmental auditing		***GOIC***		***GPC***						***T***	***CER***	***ER***
U.	(Dangelico and Pujari, 2010), (Chung and Wee, 2010), (Zhang and Li, 2019), (Berchicci and Bodewes, 2005), and (Leonidou et al., 2013).	Organizational responsibility from the product's design until the end of its life cycle, through the incorporation of environmental attributes for GPI development.	Responsibility throughout the life cycle of the product		***GOIC***	***GR&DC***	***GPC***			***GMC***		***OB***		***CER***	
V.	(Dangelico and Pujari, 2010), (Lee and Kim, 2011), (Tsai, 2012), (Chan et al., 2013), (Song et al., 2018), (Janine Fleith De Medeiros et al., 2018), (Dangelico, 2017), (Dangelico, 2016), (Melander, 2017), (Tariq et al., 2017), and (De Medeiros et al., 2014).	Awareness, identification, and compliance with environmental policies, laws, and regulations to favor the creation of green products.	Compliance with environmental regulations		***GOIC***			***GOLRC***				***OB***			***ER***

Source: Authors' elaboration.

Table 5
Matrix of the determinants driving GPI development.

Matrix of the determinants driving GPI development		Organizational dimensions for GPI				
		Human Resources (HR)	Organizational Behavior (OB)	Technology (T)	Corporate Environmental Responsibility (CER)	Environmental Regulation (ER)
Green Innovation Capabilities (GIC)	Green Strategic Planning Capability (GSPC)	[A, B, M]	[B, S]	[C, E, M]	[A, B, C, E, J, M, N, S]	[E, J, M, N]
	Green Organizational Innovation Capability (GOIC)	[B, O, P, Q, R]	[B, D, L, O, P, Q, R, U, S, U, V]	[E, G, H, L, O, P, T]	[B, D, E, G, S, T, U]	[C, D, E, G, L, T, V]
	Green R&D Capacity (GR&DC)	[O, P]	[L, O, P, U]	[C, F, G, I, L, O, P]	[C, F, G, I, J, U]	[C, F, G, I, J, L]
	Green Production Capability (GPC)	[M]	[D, L, U]	[C, E, F, G, I, L, M, T]	[C, D, E, F, G, I, J, M, T, U]	[C, D, E, F, G, I, J, L, M, T]
	Green Organizational learning and relationship capability (GOLRC)	[O, P, Q, R]	[D, L, O, P, Q, R]	[H, L, O, P]	[D]	[D, L]
	Green Resources Capability (GRC)	[M]	[M]	[C, E, F, I, M]	[C, E, F, I, M, N]	[C, E, F, I, M, N]
	Green Marketing Capability (GMC)	[K]	[D]	[H, I, K]	[D, I, J]	[D,I, J]

Source: Authors' elaboration.

4.5.1. Taxonomy of determinants in GIC and OD

The classification of determinants in GIC and OD may mean higher organizational and managerial understanding and may help to distinguish organizational factors where the determinant intervenes and should be available to channel and achieve GPI.

Continuing with the elements showed in Table 4, first there is a list of the seven GPI and five OD, and second there is a set of twenty-two associations with the respective capabilities and dimensions, given their organizational strategic extensions aimed at establishing GPI.

For instance, determinant *A, organizational policies, mission, plans, and objectives that favor GPI development,* shown in Table 4, falls within the *green strategic planning capability* because it represents a firm's ability to formulate and define organizational environmental strategies at the strategic, tactical, and operational levels. This determinant also impacts two organizational dimensions: *human resources,* since it is the staff themselves who carry out the planning activities and implement the strategies aimed at GPI development; and *environmental corporate responsibility,* because with this factor firms' efforts are directed towards reducing and/or eliminating their negative impacts on the environment which, in turn, yields benefits for their stakeholders.

Determinant *Q, green-oriented leadership and transformative behavior translated into corporate ethic, monitoring and identification of new opportunities, cross-functional collaboration, and motivation and incentives for the development of green product offerings,* shown in Table 4, impacts two capabilities: *green organizational innovation*, which concerns the ability established in a firm's design, management, and structure to face new environmental opportunities and bring them to the organization for their transformation; and *green organizational learning and relationship*, which refers to a firm's ability to learn about environmental sustainability, thus favoring the monitoring and identification of new opportunities and the improvement of its environmental actions.

For its part, determinant *V* falls within two organizational dimensions: *organizational behavior and human resources.* The first is related to the members of the firm's commitment, culture, and behavioral and motivational efforts oriented towards GPI development. And the second is the beings endowed with faculties and intelligence that can execute and materialize tangible actions through cross-functional collaboration, motivation, and incentives.

With the aim of testing the suitability of the taxonomy presented in Table 4, and by means of example, some of the theoretical referents used by the authors for the association of the sets of determinants within GIC and OD are presented. The less common name of the drivers in italics belong to this paper, and those in inverted commas are their similes identified in the theoretical references.

To this effect, what follows are the drivers that associated with GMC: *advertising evidence of GPI* is related to the factor "clear communication of green products and brand characteristics to reduce information asymmetry"(Dangelico and Vocalelli, 2017); *monitoring the market* is associated with "conducting environmental benchmarketing" (Dangelico, 2016); *client demand* coincides with "purchase intention" and "consumer buying decision" (Alharthey, 2019); *packing, packaging and green labelling* is related to "ecolabels and packaging as key identifiers of green products" (Dangelico and Vocalelli, 2017) and "environmentally friendly packaging and labeling green packaging" (Jasti et al., 2015).

Similarly, the determinants associated with *GOLRC* compare with the key factors found in papers that develop the topic of learning and green collaboration. To this effect, *human talent with green oriented competencies* relates to "development of a set of green competences" (De Medeiros et al., 2014); *institutional relations* is associated with "relationship management" and "partner selection" (Melander, 2017); *client demand* relates to "customer demand" (Melander, 2017); *complying with environmental regulations* is related with "regulations" (Melander, 2017); and *acquiring knowledge* is related to "knowledge access" (Melander, 2017).

The determinants associated with the *HR* dimension in the classification of the present paper are related to the key factors stated in papers that develop themes associated with human resources. To this effect, *human talent with green oriented competences* is associated with the determinant "employees' competence in environmental protection" (Chang, 2016); *ecological organizational leadership* with the driver "managers in the company can fully support their employees to achieve the goals of environmental protection" (Chang, 2016); and, *corporative green commitment* with "green values" (referring to individual and organizational values oriented to managing environmental sustainability) (Chams and García-Blandón, 2019). The link between the determinants *planning strategy oriented to GPI* and *the acquisition of knowledge* and *HR* is reinforced by the affirmations "human resources play a significant role in the strategic management of the organization" (Garavan et al., 2002, p. 1) and "HRM systems supporting knowledge-intensive teamwork are associated with greater team knowledge acquisition and team knowledge sharing" (Chuang et al., 2013) and (Jackson et al., 2014), respectively.

Consequently, below is a description of how each determinant impacts organizational capabilities and dimensions and how they are related and interconnected. The analysis was carried out with each identified determinant because each of them impacts, involves, and is linked to the organization and its functions at the environmental level. Hence, the importance of their taxonomy and grouping, allowing them to be reconfigured and properly distributed to identify specific actions aimed at GPI development. Table 4 shows the results of the taxonomy of determinants in GPI and OD.

4.5.2. Operationalisation matrix of the CIV, OD and determinants

Taking as a reference the previous works of Robledo-Velásquez (2020), Robledo-Velásquez et al. (2011), and Serrano-García and Robledo-Velásquez, 2013a, and summarizing the results of the taxonomy of determinants in GIC and OD postulated in Table 4, a matrix was then proposed through which the taxonomy was operationalized, illustrating the interrelation between GIC, OD and the sets of the determinants presented in Table 5. The rows and columns represent GIC and OD, respectively, and show the location of each determinant within the intersection of GIC and OD, including the one it is related to, thus facilitating an eventual organizational performance that contributes to the determinants and fosters GPI development.

This matrix shows how the determinants involve a capability, a dimension, or different combinations of these within the organization. It evinces that the whole organization must work together in permanent interrelationship between its parts and using different abilities to achieve an adequate application of the determinants leading to GPI. Accordingly, this matrix would favor the assessment of GPI development via a coherent definition of the variables representing the determinants which, in turn, would fulfill both GIC and OD.

In theory, firms should achieve all the determinants of GPI. However, making progress in each of them would allow them to gradually ascend the different levels and, at some point, fully develop GPI. Based on the proposed classification and grouping, it could be said that what is needed to comply with the determinants is a GIC strategic approach, together with green-oriented OD, since this provides the organization with support. This could lead to the commercial transformation and exploitation of firms by capturing and delivering value through GPI development. This, in turn, would encourage a context in which the organization is examined as an integral system that favors reciprocal connection and complementarity between the organization, the capabilities, the dimensions, and the determinants, thus boosting GPI development to have a positive impact on its economic, social, and environmental performance.

5. Discussion

The objective of this study was to identify the determinants and their configuration within GIC and OD for GPI development. Therefore, it moves towards the unification of the constituent elements of GPI, providing 22 sets of determinants and evincing a series of characteristics that specifically show the environmental factor being fostered by turning it into an organizational challenge. This is important because it enables the identification of which situation-capability-area each set of determinants is affecting at the organizational level to favor its interpretation and the performance/behavior placement being considered within the organization. Similarly, useful basic data are provided for future research to move forward in pursuit of improving the determinants needed in GPI configuration. Additionally, this study may serve as a starting point for the implementation of other frameworks in fields such as administration, innovation, and technology management under a green approach.

Furthermore, manufacturing companies currently need to update their capacities to promote the achievement of GPI to continue acquiring competitiveness in the market (Salim et al., 2020). At the same time, DC are necessary to favor innovation and allow companies to constantly evolve, facilitating their adaptation to environmental demands. To this effect, DC play a moderating role, intervening to create facilitate the creation of ecological product innovation (Long and Liao, 2021). Therefore, the present work considers the structure of DC, which relate properties that generate innovation such as the dynamism and evolution accomplished by means if IC.

The above explains the fact that the concepts and generalities of the seven IC are widely used nowadays to develop and define specific characteristics in each of these capabilities to provide a solution to CPI. Nonetheless, the descriptors of these seven IC in relation to the concept of GPI are unknown. Thus, one of the contributions of this paper is that it finds and connects these specific and unique elements, defining each of these already established capabilities but relocated to the green context which, to the best of the authors' knowledge and belief, has not been postulated and unified by any other author. More specifically, this study shows how the seven proposed GIC agree with key organizational abilities, which could jointly favor innovation management to respond to the green challenge. Furthermore, the form and scope of each GIC at the administrative and green technical levels are clearly described for easy understanding and application within the organization.

Moreover, this research proposes five OD that are part of an extension towards the green approach. Following Nadler et al. (2011) and Gouel (2005), the *formal organization* dimension is represented, in this study, in the *corporate environmental responsibility and environmental regulation* dimension, given that these two latter aspects correspond to organizational agreements subject to coordination and control to ensure they are complied with. The *informal organization* dimension is represented in the *organizational behavior* dimension since it appears spontaneously but affects the behavior and results of the firm in terms of sustainability. The *human talent* dimension comprises the individuals performing work activities, whose knowledge, abilities, expectations, and motivations regarding the environment must be considered. Last, the *technology* dimension is represented in the pooling of knowledge facilitating the creation of green products.

Regarding the understanding, definition and development of a GPI, we identified that to be classified as a green product it must have certain ecological technical and organizational characteristics that make it different from a conventional innovative product. However, considering the findings of this paper, what is required to achieve GPI is a systemic orientation of the organization as the facilitating entity, supported by administrative pillars such as GIC and OD which, according to the set of determinants, could favor GPI configuration.

It is clear how the sets of determinants relate to the proposed GIC and OD, with their groupings and interconnections in terms of how each of them affects, involves, and relates to the organization and its role in the environmental field illustrated, thus facilitating the integrity and consistency of the determinants. Hence, the importance of their classification and grouping within GIC and OD, as this implies a better understanding for the organization and managers. The taxonomy proposed has practical value in terms of the identification of the existing relations between the GIC, OD and the determinants, to produce a global vision of the factors required for organizational reconfiguration towards GPI development.

Having shaped the taxonomy, the matrix that operationalized GIC, OD and the determinants was created, seeking to make the interrelations and interdependencies more evident and easily understandable. This will allow the corresponding variables to be selected and controlled in the future to measure and assess the aforementioned association in terms of innovation management oriented towards GPI development.

Therefore, the matrix was developed as a systemic tool, given that it illustrates the interrelation between GIC, OD and the determinants within the organization. It is also dynamic because it can be adapted to the different variants and environments in which the company may find itself and it allows the variables to be updated and modified to reach a diagnosis that enables the strategy and the actions needed to procure achieving GPI to be defined. The matrix has been proposed from a general perspective of the organization and based on the determinants identified. However, faced with specific conditions, the matrix can evolve to adapt to each problem and organizational dynamic. Consequently, the development and updating of the matrix will allow firms to move up through the different organizational levels, leading them at some point to the full configuration of GPI.

A series of frameworks based on determinants for facing GPI at the organizational level have been proposed in several research articles. Dangelico (2016) suggests a success factor framework for GPI development that includes four capabilities: external integrative, technological, internal integrative, and marketing. For his part, Melander (2018) combines the frameworks proposed by Dangelico (2016) and Melander

(2017) under internal and external capabilities and focuses on firm collaboration in the lengthening of the supply chain with suppliers and clients for GPI development. Although there are groupings of determinants based on capabilities in these proposals, there was still need for a specific, holistic, and strategic approach capable of containing most of the determinants of GPI leading to organizational functions.

Tariq et al. (2017) propose a framework based on the identification of drivers (factors) and consequences (performance) for ecological processes and products. This interrelation is carried out from the identification of measuring and moderating variables, within which the framework resorts to linking certain capabilities and thematic organizational approaches. However, these authors call for the structuring of organizational factors using DC to advance in responding to the environmental challenges.

Berchicci and Bodewes (2005) present a framework that includes three organizational aspects: design specifications, coordination and alignment within teams, and project management support. This framework considers the lack of specificity, for instance the required research and development approach to contribute to determinants such as clean processes and technologies, and organizational learning, evidencing the need for knowledge regarding environmental sustainability and strategic planning linked to greening at the organizational level, among other necessary factors for the determinants of GPI.

Jasti et al. (2015) identify principles, tools, and techniques to develop green products. Their study includes up to 80 similar elements that are then grouped in eleven strategic organizational factors. However, no GIC and OD are considered which, according to our grouping and taxonomy, must be considered to support the determinants of GPI. Moreover, capabilities such as research and development, resource management, and organizational learning are not considered, and neither are dimensions such as human talent management, organizational behavior, social responsibility, and environmental regulation.

The main focus of the study conducted by Janine Fleth De Medeiros et al. (2018a,b) is the planning, operation, and marketing of green product development. Nevertheless, aspects such as human talent management, organizational behavior, social responsibility, research and development, and organizational learning and relationships aimed at GPI are not considered in their proposal.

Ilg (2019) proposes an analytical framework in the form of a virtuous circle for the development of ecological materials and products in the construction industry, thus fostering ecological innovation by considering suitable organizational approaches. However, neither the GIC concept nor research and development capability, which contributes to research on new technologies in the construction field, are considered in these frameworks.

Considering the above, there is no conceptual scenario shown that displays how the determinants are organized under an integral approach, supported by the seven proposed GIC and the structuring of the five identified OD, to respond to the transformation of processes that favor innovation management oriented towards the green approach. To the best of the authors' knowledge and belief, this is the first research that postulates the articulation of GIC and OD to favor innovation management and its corresponding extension to GPI. Additionally, the authors would like to highlight that despite the number of proposed and related GIC and OD, they were brought about under the scrutiny of the identification, grouping, and taxonomy classification of the required determinants in pursuit of GPI.

The proposed framework, made up of the taxonomy and the matrix, considers the organization to be an interrelated system in which the proposed foundations adjust, mutually support, and continuously coordinate to achieve the innovation management objectives, according to the planned strategies (Nadler and Tushman, 1998). This framework provides a structural relation of the organizational elements, allowing the strategies, functions, and actions to be redirected to strengthen technological innovation management in pursuit of GPI creation and development. Therefore, the proposal to organizations to be able to reconfigure themselves to achieve GPI presented in this paper is the association of the determinants of GPI with GIC and OD, structured in the taxonomy and operationalized in the matrix, based on innovation management.

By way of analogy, and to visualize the proposal presented in this paper in a holistic and general way, the authors envisage the framework located in the organization as a tree, under which the structural relationship to achieve GPI is interpreted. The roots represent GIC, whose function is to absorb the nutrients to ensure its growth. Meanwhile, these roots connect to the trunk and the branches representing the five OD as a fundamental component, which themselves project out in a way that maximises the absorption of energy through the leaves, symbolising the determinants and, at the same time, satisfying the needs of the fruit, which represents the creation of GPI. In this analogy, the fruit depends on the leaves and the branches, and the branches strongly depend on the health of the tree trunk and the solid structural base provided by the roots. Similarly, given that the seven proposed GIC and five OD that make up the organizational reconfiguration make it easier for firms to adapt, the consistency and integrity of the determinants leading to GPI development are also facilitated.

6. Conclusions

Nowadays, firms have a tremendous opportunity to be competitive if they become involved in GPI. However, to do so, they need to change and reconfigure themselves based on certain organizational skills and dimensions that would then serve as the foundations for the determinants required for GPI development.

This paper proposes the extension and adjustment of seven GIC to create and develop green products based on the new demands of the environment. These GIC were carefully selected and arranged to guide firms to reconfigure themselves and optimize their environmental actions. Moreover, the proposed OD are regarded as constitutive and support elements associated with organizational changes, adaptation, and revitalization from an environmental perspective. Hence, GIC and OD together are factors that could shape a set of organizational adjustments required for firms to address their current responsibility in terms of developing green products.

Furthermore, after gathering and analyzing previous studies in the field, strategic determinants that influence the development and implementation of GPI were identified and thoroughly classified. These determinants refer to the attributes that firms should consider when they decide to address the challenge of GPI. In addition, they are factors that require a solid base at the organizational level, leading us to identify their required connection and association with the proposed GIC and OD.

Therefore, another outcome of this research is the classification and strategic association of the determinants of GPI within the different GIC and OD, showing how they relate to each other and facilitating the identification of actions inherent to innovation management to help organizations to face and address their needs in terms of GPI. Likewise, a matrix is established, which allows organizations to assess and monitor their progress in GPI management.

The proposed framework combines typical and necessary organizational factors. It could be seen as a roadmap for firms to understand their organizational redesign when they are adapting and being revitalized based on the scenarios, interdisciplinarity, and eventualities of the current context in terms of environmental sustainability. This framework fosters links in the evolution of the organization, supported by GIC and OD, which are represented in the innovative and technological transforming processes and abilities to meet the requirements of the determinants and to finally deliver a GPI.

In general, this framework regards organizations as open systems of interconnected parts that facilitate their constant adaptation to boost GPI development. Therefore, the proposed framework could become a tool for the transition and/or transformation of firms towards the

development of environmentally friendly products from the innovative perspective of their new organizational commitment.

This study aims to contribute to the advancement in the organizational and technological innovation management theories towards GPI consolidation, as well as to the research on the structuring of environmental sustainability at the organizational level. It is especially intended for researchers, managers in the manufacturing sector, and government bodies interested in environmental sustainability, proposing a holistic and systematic approach that redefines the boundaries of opportunities for new competence and performance. Various studies have found all these aspects to be missing and necessary (Dangelico et al., 2016; Engert et al., 2016; Leih et al., 2015; Shevchenko et al., 2016; Teece, 2018a).

6.1. Limitations and future work

A series of limitations that can also be opportunities for further research were identified, the purpose of which is to encourage creativity in the debate and discussion generated by our work. The first is that we did not consider other organizational and technology management lines of theory that could also favor the strengthening and development of GPI. Second, future research should study each GIC separately in combination with each OD to favor GPI development, as well as design a conceptual framework from other perspectives and under different grouping and correlation criteria. Third, given that this work mainly focused on theoretical and conceptual aspects, it is recommended that further research converts the sets of determinants into variables that can be implemented and controlled by firms. Fourth, the framework developed could be applied in studies whose aim is to study the environments and the varied conditions in which the company can find itself, to ensure the advance towards the constitution of GIP. Fifth, one aspect to consider from the basis created is the development of future empirical research to analyze its validity and reliability in real settings, and to identify possible configurations and impacts on organizational performance.

Funding

This research received no external funding.

CRediT authorship contribution statement

Jakeline Serrano-García: Conceptualization, Methodology, Formal analysis, Investigation, Resources, Writing – original draft, Project administration, Funding acquisition. **Andrea Bikfalvi:** Conceptualization, Methodology, Formal analysis, Investigation, Resources, Writing – review & editing, Supervision, Project administration, Funding acquisition. **Josep Llach:** Conceptualization, Methodology, Formal analysis, Investigation, Resources, Writing – review & editing, Supervision, Project administration, Funding acquisition. **Juan José Arbeláez-Toro:** Conceptualization, Methodology, Formal analysis, Writing – review & editing, Project administration.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

The study recieved funding from the Ministerio de Economía y Competitividad (MINECO, Spain) project titled Efficiency, Innovation, Competitiveness and Sustainable Business Performance (EFICOSPER), ECO2017-86054-C3-3-R. The authors thank the Metropolitan Technological Institute in Medellín-Colombia for funding Jakeline Serrano García's doctoral research placement. Special thanks are also due to Professor Jorge Robledo-Velásquez for the contributions he provided to this manuscript, to Professor Fernando Jiménez-Saez for his support and assistance in the doctoral process, and to the editor and anonymous referees for their constructive comments and suggestions.

References

Renard, L., St-amant, G.E., 2003. Capacité, capacité organisationnelle et capacité dynamique : une proposition de définitions. Les Cah. du Manag. Technol. 13, 43–56.
Adler, P., Sbenbar, A., 1990. Adapting your technological base: the organizational challenge. Sloan Manag. Rev. 32, 25–37.
Albino, V., Balice, A., Dangelico, R.M., 2009. Environmental strategies and green product development: an overview on sustainability-driven companies. Bus. Strat. Environ. 18, 83–96. https://doi.org/10.1002/bse.638.
Albort-Morant, G., Leal-Millán, A., Cepeda-Carrión, G., 2016. The antecedents of green innovation performance: a model of learning and capabilities. J. Bus. Res. 69, 4912–4917. https://doi.org/10.1016/j.jbusres.2016.04.052.
Alharthey, B.K., 2019. Impact of green marketing practices on consumer purchase intention and buying decision with demographic characteristics as moderator. Int. J. Adv. Appl. Sci. 6, 62–71. https://doi.org/10.21833/ijaas.2019.03.010.
Amores-Salvadó, J., Martín-de Castro, G., Navas-López, J.E., 2015. The importance of the complementarity between environmental management systems and environmental innovation capabilities: a firm level approach to environmental and business performance benefits. Technol. Forecast. Soc. Change 96, 288–297. https://doi.org/10.1016/j.techfore.2015.04.004.
Archie, C.B., Carroll, A.B., 1991. The pyramid of corporate social responsibility: toward the moral management of organizational stakeholders. Bus. Horiz. 34, 39–48. https://doi.org/10.1016/0007-6813(91)90005-g.
Ardyan, E., Rahmawan, G., Tinggi, S., Ekonomi, I., 2017. Green innovation capability as driver of sustainable competitive advantages and smes marketing performance. Int. J. Civ. Eng. Technol. 8, 1114–1122.
Armbruster, H., Bikfalvi, A., Kinkel, S., Lay, G., 2008. Organizational innovation: the challenge of measuring non-technical innovation in large-scale surveys. Technovation 28, 644–657. https://doi.org/10.1016/j.technovation.2008.03.003.
Berchicci, L., Bodewes, W., 2005. Bridging environmental issues with new product development. Bus. Strat. Environ. 14, 272–285. https://doi.org/10.1002/bse.488.
Berry, M.A., Randinelli, D.A., 1998. Proactive corporate Environmental Management: a new industrial revolution. Acad. Manag. Exec. 2, 39–50.
Bhaskar, A.U., Mishra, B., 2017. Exploring relationship between learning organizations dimensions and organizational performance. Int. J. Emerg. Mark. 12, 593–609. https://doi.org/10.1108/IJoEM-01-2016-0026.
Block, M.R., Marash, R., 2002. Integración de la ISO 14000 en un sistema de gestión de la calidad, 3a. ed. Madrid - España.
Bocken, N.M.P., de Pauw, I., Bakker, C., van der Grinten, B., 2016. Product design and business model strategies for a circular economy. J. Ind. Prod. Eng. 33, 308–320. https://doi.org/10.1080/21681015.2016.1172124.
Bolden, R., Waterson, P., Warr, P., Clegg, C., Wall, T., 1997. A new taxonomy of modern manufacturing practices. Int. J. Oper. Prod. Manag. 17, 1112–1130. https://doi.org/10.1108/01443579710177879.
Bowen, F.E., Cousins, P.D., Lamming, R.C., Faruk, A.C., 2001. The role of supply management capabilities in green supply. Prod. Oper. Manag. 10, 174–189. https://doi.org/10.1111/j.1937-5956.2001.tb00077.x.
Burgelman, R., Maidique, M., Wheelwright, S., 2004. Strategic Management of Technology and Innovation. McGraw-Hill.
Chams, N., García-Blandón, J., 2019. On the importance of sustainable human resource management for the adoption of sustainable development goals. Resour. Conserv. Recycl. 141, 109–122. https://doi.org/10.1016/j.resconrec.2018.10.006.
Chan, H.K., Wang, X., White, G.R.T., Yip, N., 2013. An extended fuzzy-AHP approach for the evaluation of green product designs. IEEE Trans. Eng. Manag. 60, 327–339. https://doi.org/10.1109/TEM.2012.2196704.
Chang, C.H., 2016. The determinants of green product innovation performance. Corp. Soc. Responsib. Environ. Manag. 23, 65–76. https://doi.org/10.1002/csr.1361.
Chang, C.H., 2017. How to enhance green service and green product innovation performance? The roles of inward and outward capabilities. Corp. Soc. Responsib. Environ. Manag. 425, 411–425. https://doi.org/10.1002/csr.1469.
Chen, C., 2001. Design for the environment: a quality-based model for green product development. Manag. Sci. 47 (2), 250–263. https://doi.org/10.1287/mnsc.47.2.250.9841.
Chen, Y.S., Chang, C.H., 2013. The determinants of green product development performance: green dynamic capabilities, green transformational leadership, and green creativity. J. Bus. Ethics 116, 107–119. https://doi.org/10.1007/s10551-012-1452-x.
Chen, Y., Lin, S., Wen, C., 2006. The influence of green innovation performance on corporate advantage in Taiwan. J. Bus. Ethics 67, 331–339. https://doi.org/10.1007/s10551-006-9025-5.
Cheung, M.F.Y., To, W.M., 2019. An extended model of value-attitude-behavior to explain Chinese consumers' green purchase behavior. J. Retailing Consum. Serv. 50, 145–153. https://doi.org/10.1016/j.jretconser.2019.04.006.
Chiavenato, I., 2006. Introducción a la teoría general de la administración, Séptima ed. McGraw-Hill Interamericana, México.
Chiavenato, I., 2009. Administración de recursos humanos. El capital humano de las organizaciones, Octava. McGraw-Hill Interamericana, México.

Chkanikova, O., 2016. Sustainable purchasing in food retailing: interorganizational relationship management to green product supply. Bus. Strat. Environ. 25, 478–494. https://doi.org/10.1002/bse.1877.
Chuang, C.H., Jackson, S.E., Jiang, Y., 2013. Can knowledge-intensive teamwork Be managed? Examining the roles of HRM systems, leadership, and tacit knowledge. J. Manag. https://doi.org/10.1177/0149206313478189.
Chung, C.J., Wee, H.M., 2010. Green-product-design value and information-technology investment on replenishment model with remanufacturing. Int. J. Comput. Integrated Manuf. 23, 466–485. https://doi.org/10.1080/09511921003667714.
Daft, R.L., 2011. Teoría Y Diseño Organizacional, Décima. Cengage Learning Editores.
Dangelico, R.M., 2016. Green Product Innovation: where we are and where we are Going. Bus. Strat. Environ. 25, 560–576. https://doi.org/10.1002/bse.1886.
Dangelico, R.M., 2017. What drives green product development and how do different antecedents affect market performance? A survey of Italian companies with eco-labels. Bus. Strat. Environ. 26, 1144–1161. https://doi.org/10.1002/bse.1975.
Dangelico, R.M., Pujari, D., 2010. Mainstreaming green product innovation: why and how companies integrate environmental sustainability. J. Bus. Ethics 95, 471–486. https://doi.org/10.1007/s10551-010-0434-0.
Dangelico, R.M., Vocalelli, D., 2017. "Green Marketing": an analysis of definitions, strategy steps, and tools through a systematic review of the literature. J. Clean. Prod. 165, 1263–1279. https://doi.org/10.1016/j.jclepro.2017.07.184.
Dangelico, R.M., Pujari, D., Pontrandolfo, P., 2016. Green product innovation in manufacturing firms: a sustainability-oriented dynamic capability perspective. Bus. Strat. Environ. 26, 490–506. https://doi.org/10.1002/bse.1932.
De Medeiros, J.F., Ribeiro, J.L.D., Cortimiglia, M.N., 2014. Success factors for environmentally sustainable product innovation: a systematic literature review. J. Clean. Prod. 65, 76–86. https://doi.org/10.1016/j.jclepro.2013.08.035.
De Medeiros, Fleth, Janine, Lago, N.C., Colling, C., Ribeiro, J.L.D., Marcon, A., Duarte Ribeiro, J.L., Marcon, A., 2018a. Proposal of a novel reference system for the green product development process (GPDP). J. Clean. Prod. 187, 984–995. https://doi.org/10.1016/j.jclepro.2018.03.237.
De Medeiros, Fleith, Janine, Vidor, G., Ribeiro, J.L.D., 2018b. Driving factors for the success of the green innovation market: a relationship system proposal. J. Bus. Ethics 147, 327–341. https://doi.org/10.1007/s10551-015-2927-3.
Dost, M., Pahi, M.H., Magsi, H.B., Umrani, W.A., 2019. Influence of the best practices of environmental management on green product development. J. Environ. Manag. 241, 219–225. https://doi.org/10.1016/j.jenvman.2019.04.006.
Edison, H., Bin Ali, N., Torkar, R., 2013. Towards innovation measurement in the software industry. J. Syst. Software 86, 1390–1407. https://doi.org/10.1016/j.jss.2013.01.013.
El-Kassar, A.N., Singh, S.K., 2019. Green innovation and organizational performance: the influence of big data and the moderating role of management commitment and HR practices. Technol. Forecast. Soc. Change 144, 483–498. https://doi.org/10.1016/j.techfore.2017.12.016.
Engert, S., Rauter, R., Baumgartner, R.J., 2016. Exploring the integration of corporate sustainability into strategic management: a literature review. J. Clean. Prod. 112, 2833–2850. https://doi.org/10.1016/j.jclepro.2015.08.031.
Fan, X., Liu, W., Zhu, G., 2017. Scientific linkage and technological innovation capabilities: international comparisons of patenting in the solar energy industry. Scientometrics 111, 117–138. https://doi.org/10.1007/s11192-017-2274-5.
Fernando, Y., Chiappetta Jabbour, C.J., Wah, W.X., 2019. Pursuing green growth in technology firms through the connections between environmental innovation and sustainable business performance: does service capability matter? Resour. Conserv. Recycl. 141, 8–20. https://doi.org/10.1016/j.resconrec.2018.09.031.
Fjeldstad, Ø.D., Snow, C.C., 2018. Business models and organization design. Long. Range Plan. 51, 32–39. https://doi.org/10.1016/j.lrp.2017.07.008.
Foo, M.Y., Kanapathy, K., Zailani, S., Shaharudin, M.R., 2019. Green purchasing capabilities, practices and institutional pressure. Manag. Environ. Qual. Int. J. 30, 1171–1189. https://doi.org/10.1108/MEQ-07-2018-0133.
Foss, N.J., Saebi, T., 2015. Business models and business model innovation bringing organization into the discussion. Business Model Innovation: the Organizational Dimension. Oxford University Press, Oxford, pp. 1–26. https://doi.org/10.1093/acprof:oso/9780198701873.001.0001.
Galbraith, J.R., 1982. Designing the innovating organization. Organ. Dynam. 5–25.
Gao, X., Zhang, W., 2013. Foreign investment, innovation capacity and environmental efficiency in China. Math. Comput. Model. 58, 1040–1046. https://doi.org/10.1016/j.mcm.2012.08.012.
Garavan, T.N., Morley, M., Gunnigle, P., Mcguire, D., 2002. Human resource development and workplace learning: emerging theoretical perspectives and organisational practices. J. Eur. Ind. Train. 26, 60–71. https://doi.org/10.1108/03090590210428133.
Geiger, N., Swim, J.K., Glenna, L., 2019. Spread the green word: a social community perspective into environmentally sustainable behavior. Environ. Behav. 51, 561–589. https://doi.org/10.1177/0013916518812925.
Gouel, P., 2005. Theories of Organization. Industrial and Operations Engineering, Course IOE 421 Work Organizations. Michigan, USA. Michigan, USA.
Grave, M., 1992. The green of business document: an environmental strategy for micrographics. IMC J. 4, 117–186.
Guan, J., Ma, N., 2003. Innovative capability and export performance of Chinese firms. Technovation—The Int. J. Technol. Innov. Entrep. 23, 737–747.
Guan, J.C., Yam, R.C.M., Mok, C.K., Ma, N., Kam, C., Ma, N., 2006. A study of the relationship between competitiveness and technological innovation capability based on DEA models. Eur. J. Oper. Res. 170, 971–986. https://doi.org/10.1016/j.ejor.2004.07.054.
Hart, S.L., 1995. A natural-resource-based view of the firm. Acad. Manag. Rev. 20 https://doi.org/10.5465/AMR.1995.9512280033.
Hart, S.L., Dowell, G., 2011. A natural-resource-based view of the firm: fifteen years after. J. Manag. 37, 1464–1479. https://doi.org/10.1177/0149206310390219.
Herrera-Baltazar, M.E., 2015. Creating competitive advantage by institutionalizing corporate social innovation. J. Bus. Res. 68, 1468–1474. https://doi.org/10.1016/j.jbusres.2015.01.036.
Huang, Y.C., Wu, Y.C.J., 2010. The effects of organizational factors on green new product success: evidence from high-tech industries in Taiwan. Manag. Decis. 48, 1539–1567. https://doi.org/10.1108/00251741011090324.
Huang, Y.C., Yang, M.L., Wong, Y.J., 2016. The effect of internal factors and family influence on firms' adoption of green product innovation. Manag. Res. Rev. 39, 1167–1198. https://doi.org/10.1108/MRR-02-2015-0031.
Huijben, J.C.C.M., Verbong, G.P.J., Podoynitsyna, K.S., 2016. Mainstreaming solar: stretching the regulatory regime through business model innovation. Environ. Innov. Soc. Trans. 20, 1–15. https://doi.org/10.1016/j.eist.2015.12.002.
Hukkinen, J., 1995. Green virus: exploring the environmental product concept. Bus. Strateg. Environ. 4, 135–144.
Ilg, P., 2019. How to foster green product innovation in an inert sector. J. Innov. Knowl. 4, 129–138. https://doi.org/10.1016/j.jik.2017.12.009.
Jabbour, C.J.C., Jugend, D., De Sousa Jabbour, A.B.L., Gunasekaran, A., Latan, H., 2015. Green product development and performance of Brazilian firms: measuring the role of human and technical aspects. J. Clean. Prod. 87, 442–451. https://doi.org/10.1016/j.jclepro.2014.09.036.
Jackson, S.E., Schuler, R.S., Jiang, K., 2014. An aspirational framework for strategic human resource management. Acad. Manag. Ann. 8, 1–56. https://doi.org/10.1080/19416520.2014.872335.
Jakhar, S.K., Mangla, S.K., Luthra, S., Kusi-Sarpong, S., 2019. When stakeholder pressure drives the circular economy: measuring the mediating role of innovation capabilities. Manag. Decis. 57, 904–920. https://doi.org/10.1108/MD-09-2018-0990.
Jaspers, F., Prencipe, A., Van Den Ende, J., 2012. Organizing interindustry architectural innovations: evidence from mobile communication applications. J. Prod. Innovat. Manag. 29, 419–431. https://doi.org/10.1111/j.1540-5885.2012.00915.x.
Jasti, N.V.K., Sharma, A., Karinka, S., 2015. Development of a framework for green product development. Benchmark Int. J. 22, 426–445. https://doi.org/10.1108/BIJ-06-2014-0060.
Joo, H.Y., Seo, Y.W., Min, H., 2018. Examining the effects of government intervention on the firm's environmental and technological innovation capabilities and export performance. Int. J. Prod. Res. 56, 6090–6111. https://doi.org/10.1080/00207543.2018.1430902.
Khan, S.A.R., Yu, Z., Golpira, H., Sharif, A., Mardani, A., 2021. A state-of-the-art review and meta-analysis on sustainable supply chain management: future research directions. J. Clean. Prod. 278, 123357. https://doi.org/10.1016/j.jclepro.2020.123357.
Kim, M.K., Sheu, C., Yoon, J., 2018. Environmental sustainability as a source of product innovation: the role of governance mechanisms in manufacturing firms. Sustain. Times 10. https://doi.org/10.3390/su10072238.
Kong, T., Feng, T., Ye, C., 2016. Advanced manufacturing technologies and green innovation: the role of internal environmental collaboration. Sustain. Times 8, 9–11. https://doi.org/10.3390/su8101056.
Kramar, R., 2014. Beyond strategic human resource management: is sustainable human resource management the next approach? Int. J. Hum. Resour. Manag. 25, 1069–1089. https://doi.org/10.1080/09585192.2013.816863.
Lahovnik, M., Breznik, L., 2014. Technological innovation capabilities as a source of competitive advantage: a case study from the home appliance industry. Transform. Bus. Econ. 13, 144–160.
Lee, K.H., Kim, J.W., 2011. Integrating suppliers into green product innovation development: an empirical case study in the semiconductor industry. Bus. Strat. Environ. 20, 527–538. https://doi.org/10.1002/bse.714.
Leih, S., Linden, G., Teece, D.J.T., 2015. Business model innovation and organizational design. A dynamic capabilities perspective. In: Business Model Innovation: the Organizational Dimension. Oxford, pp. 1–23. https://doi.org/10.1093/acprof.
Leonidou, C.N., Katsikeas, C.S., Morgan, N.A., 2013. "Greening" the marketing mix: do firms do it and does it pay off? J. Acad. Market. Sci. 41, 151–170. https://doi.org/10.1007/s11747-012-0317-2.
Liao, Y.C., Tsai, K.H., 2019. Innovation intensity, creativity enhancement, and eco-innovation strategy: the roles of customer demand and environmental regulation. Bus. Strat. Environ. 28, 316–326. https://doi.org/10.1002/bse.2232.
Lin, P.C., Huang, Y.H., 2012. The influence factors on choice behavior regarding green products based on the theory of consumption values. J. Clean. Prod. 22, 11–18. https://doi.org/10.1016/j.jclepro.2011.10.002.
Lin, Y., Tseng, M.L., Chen, C.C., Chiu, A.S.F., 2011. Positioning strategic competitiveness of green business innovation capabilities using hybrid method. Expert Syst. Appl. 38, 1839–1849. https://doi.org/10.1016/j.eswa.2010.07.113.
Lisi, W., Zhu, R., Yuan, C., 2019. Embracing green innovation via green supply chain learning: the moderating role of green technology turbulence. Sustain. Dev. 1–14 https://doi.org/10.1002/sd.1979.
Liu, Z., Gong, Y., 2018. The threshold effect of environmental regulation on green technology innovation capability: an empirical test of Chinese manufacturing industries. Ekoloji 27, 503–516.
Long, S., Liao, Z., 2021. Are fiscal policy incentives effective in stimulating firms' eco-product innovation? The moderating role of dynamic capabilities. Bus. Strat. Environ. 1–10. https://doi.org/10.1002/bse.2791.
López-Cabarcos, M.Á., Pérez-Pico, A.M., López-Pérez, M.L., 2019. Does social network sentiment influence S & P 500 environmental & socially responsible index? Sustain. Times 11. https://doi.org/10.3390/su11020320.
Ludevid, M., 2000. La gestión ambiental de la empresa. In: Ariel Economía, Primera ed.

Ma, Y., Yin, Q., Pan, Y., Cui, W., Xin, B., Rao, Z., 2018. Green product innovation and firm performance: assessing the moderating effect of novelty-centered and efficiency-centered business model design. Sustain. Times 10. https://doi.org/10.3390/su10061843.

Majumdar, S.K., Marcus, A. a, 2001. Rules versus discretion: the productivity consequences of flexible regulation. Acad. Manag. J. 44, 170–179. https://doi.org/10.2307/3069344.

Makower, J., Elkington, J., Hailes, J., 1993. The Green Consumer. Penguin, New York, NY, USA.

Melander, L., 2017. Achieving sustainable development by collaborating in green product innovation. Bus. Strat. Environ. 26, 1095–1109. https://doi.org/10.1002/bse.1970.

Melander, L., 2018. Customer and supplier collaboration in green product innovation: external and internal capabilities. Bus. Strat. Environ. 27, 677–693. https://doi.org/10.1002/bse.2024.

Mellett, S., Kelliher, F., Harrington, D., 2018. Network-facilitated green innovation capability development in micro-firms. J. Small Bus. Enterprise Dev. 25, 1004–1024. https://doi.org/10.1108/JSBED-11-2017-0363.

Mousavi, S., Bossink, B.A.G., 2018. Firms' capabilities for sustainable innovation: the case of biofuel for aviation. J. Clean. Prod. 167, 1263–1275. https://doi.org/10.1016/j.jclepro.2017.07.146.

Nadler, D., Tushman, M., 1980. A model for diagnosing organizational behavior. Organ. Dynam. 9, 35–51. https://doi.org/10.1016/0090-2616(80)90039-X.

Nadler, D.A., Tushman, M.L., 1997. Competing by design: the power of organizational architecture, competing by design. Oxford University Press. https://doi.org/10.1093/acprof:oso/9780195099171.001.0001.

Nadler, D., Tushman, M., 1998. A model for diagnosing organizational behavior. Organ. Dynam.

Nadler, D., Tushman, M., Nadler, M., 2011. Chapter 3: mapping the organizational terrain university. Competing by Design: the Power of Organizational. Oxford Scholarship Online, Oxford Scholarship, pp. 603–610. https://doi.org/10.1093/acprof:oso/9780195099171.001.0001.

Niedermeier, A., Emberger-Klein, A., Menrad, K., 2021. Drivers and barriers for purchasing green Fast-Moving Consumer Goods: a study of consumer preferences of glue sticks in Germany. J. Clean. Prod. 284, 124804. https://doi.org/10.1016/j.jclepro.2020.124804.

Nonaka, I., 1994. A dynamic theory of organizational knowledge creation. Organ. Sci. 5, 14–37. https://doi.org/10.1287/orsc.5.1.14.

Ocde, 2015. Frascati Manual 2015: Guidelines for Collecting and Reporting Data on Research and Experimental Development, the Measurement of Scientific, Technological and Innovation Activities, the Measurement of Scientific, Technological and Innovation Activities. París. https://doi.org/10.1787/9789264239012-en.

OECD/Eurostat, 2005. Manual de Oslo, Guía para la recogida e interpretación de datos sobre innovación. Luxembourg, Tercera. https://doi.org/10.1787/9789264065659-es.

OECD/Eurostat, 2018. Oslo Manual: Guidelines for Collecting, Reporting and Using Data on Innovation, fourth ed. Paris/Eurostat, Luxembourg. https://doi.org/10.1787/9789264304604-en.

Oliveira, G.A., Tan, K.H., Guedes, B.T., 2018. Lean and green approach: an evaluation tool for new product development focused on small and medium enterprises. Int. J. Prod. Econ. 205, 62–73. https://doi.org/10.1016/j.ijpe.2018.08.026.

Patrucco, A.S., Walker, H., Luzzini, D., Ronchi, S., 2019. Which shape fits best? Designing the organizational form of local government procurement. J. Purch. Supply Manag. 25, 100504. https://doi.org/10.1016/j.pursup.2018.06.003.

Peattie, K., 1992. Green Marketing. Pitman Publishing, London, UK.

Pellegrini, C., Rizzi, F., Frey, M., 2018. The role of sustainable human resource practices in influencing employee behavior for corporate sustainability. Bus. Strat. Environ. 27, 1221–1232. https://doi.org/10.1002/bse.2064.

Pérez-Pérez, J.F., Parra, J.F., Serrano-García, J., 2021. A system dynamics model : transition to sustainable processes. Technol. Soc. 65, 1–16. https://doi.org/10.1016/j.techsoc.2021.101579.

Pons, M., Bikfalvi, A., Llach, J., 2018. Clustering product innovators: a comparison between conventional and green product innovators. Int. J. Prod. Manag. Eng. 6, 37. https://doi.org/10.4995/ijpme.2018.8762.

Porter, M.E., Van der Linde, C., 1995. Toward a new conception of the environment-competitiveness relationship. J. Econ. Perspect. 9, 97–118. https://doi.org/10.1257/jep.9.4.97.

Prakash, A., 2000. Greening the Firm: the Politics of Corporate Environmentalism. Cambridge University Press, Cambridge.

Ramanathan, R., He, Q., Black, A., Ghobadian, A., Gallear, D., 2017. Environmental regulations, innovation and firm performance: a revisit of the Porter hypothesis. J. Clean. Prod. 155, 79–92. https://doi.org/10.1016/j.jclepro.2016.08.116.

Ramanathan, R., Ramanathan, U., Bentley, Y., 2018. The debate on flexibility of environmental regulations, innovation capabilities and financial performance – a novel use of DEA. Omega (United Kingdom) 75, 131–138. https://doi.org/10.1016/j.omega.2017.02.006.

Rehman Khan, S.A., Zhang, Y., Anees, M., Golpîra, H., Lahmar, A., Qianli, D., 2018. Green supply chain management, economic growth and environment: a GMM based evidence. J. Clean. Prod. 185, 588–599. https://doi.org/10.1016/j.jclepro.2018.02.226.

Robbins, S.P., Coulter, M., 2014. Administración, Décimosegunda. Pearson Educación, España.

Robbins, S.P., Judge, T.A., 2009. Comportamiento Organizacional. Decimotercera Pearson Educación, México.

Robledo Velásquez, J., 2019. Introducción a la Gestión de la Tecnología y la Innovación Empresarial. Universidad Nacional de Colombia - Sede Medellín.

Robledo Velásquez, J., 2020. Introducción a la gestión de la tecnología y la innovación empresarial, Primera. Universidad Nacional de Colombia. Facultad de Minas, Medellín.

Robledo-Velásquez, J., Aguilar-Zambrano, J., Pérez-Vélez, J., 2011. Methodological tool for measurement and assessment of technological innovation capabilities. Technol. Manag. Energy Smart. World 1–8.

Rodriguez, J.A., Wiengarten, F., 2017. The role of process innovativeness in the development of environmental innovativeness capability. J. Clean. Prod. 142, 2423–2434. https://doi.org/10.1016/j.jclepro.2016.11.033.

Saenz, S., Atoche-Kong, C., 2014. Profiting from environmental economic regulations: the mediating role of innovation capabilities. Manag. Eng. Technol. (PICMET), 2014 Portl. Int. Conf. 1626–1632.

Salim, N., Rahman, M.N.A., Wahab, D.A., Muhamed, A.A., 2020. Influence of social media usage on the green product innovation of manufacturing firms through environmental collaboration. Sustain. Times 12, 1–17. https://doi.org/10.3390/su12208685.

Sana, S.S., 2020. Price competition between green and non green products under corporate social responsible firm. J. Retailing Consum. Serv. 55, 102118. https://doi.org/10.1016/j.jretconser.2020.102118.

Sdrolia, E., Zarotiadis, G., 2019. A comprehensive review for green product term : from definition to evaluation. J. Econ. Surv. 33, 150–178. https://doi.org/10.1111/joes.12268.

Serrano-García, J., Robledo-Velásquez, J., 2013a. Methodology for evaluating Innovation Capabilities at university institutions using a fuzzy system. J. Technol. Manag. Innovat. 8, 246–259. https://doi.org/10.4067/s0718-27242013000300051.

Serrano-García, J., Robledo Velásquez, J., 2013b. Variables para la medicion de las capacidades de innovación tecnológica en instituciones universitarias. Ciencias Estratégicas 22, 267–284.

Serrano-García, J., Acevedo-Álvarez, C.A., Castelblanco-Gómez, J.M., Arbeláez-Toro, J. J., 2017. Measuring organizational capabilities for technological innovation through a fuzzy inference system. Technol. Soc. 50, 93–109. https://doi.org/10.1016/j.techsoc.2017.05.005.

ShabbirHusain, R.V., Varshney, S., 2019. Is current way of promoting sustainability, sustainable? J. Nonprofit & Public Sect. Mark. 31, 84–113. https://doi.org/10.1080/10495142.2018.1526735.

Shevchenko, A., Lévesque, M., Pagell, M., 2016. Why firms delay reaching true sustainability. J. Manag. Stud. 53, 911–935. https://doi.org/10.1111/joms.12199.

Siegel, D.S., 2009. Green management matters only if it yields more: an economic/strategic perspective. Acad. Manag. Perspect. 23, 5–17.

Simon, J.L., 1971. The Management of Advertising. Prentice-Hall, Englewood Cliffs, NJ, USA.

Song, W., Ren, S., Yu, J., 2018. Bridging the gap between corporate social responsibility and new green product success: the role of green organizational identity. Bus. Strat. Environ. 28, 88–97. https://doi.org/10.1002/bse.2205.

Spack, J.A., Board, V.E., Crighton, L.M., Kostka, P.M., Ivory, J.D., 2012. It's easy being green: the effects of argument and imagery on consumer responses to green product packaging. Environ. Commun. 6, 441–458. https://doi.org/10.1080/17524032.2012.706231.

Stucki, T., 2019. What hampers green product innovation: the effect of experience. Ind. Innovat. 26, 1242–1270. https://doi.org/10.1080/13662716.2019.1611417.

Su, J.C.P., Wang, L., Ho, J.C., 2017. The timing of green product introduction in relation to technological evolution. J. Ind. Prod. Eng. 34, 159–169. https://doi.org/10.1080/21681015.2016.1233911.

Tan, C.N.L., Ojo, A.O., Thurasamy, R., 2019. Determinants of green product buying decision among young consumers in Malaysia. Young Consum. 20, 121–137. https://doi.org/10.1108/YC-12-2018-0898.

Tariq, A., Badir, Y.F., Tariq, W., Bhutta, U.S., 2017. Drivers and consequences of green product and process innovation: a systematic review, conceptual framework, and future outlook. Technol. Soc. 51, 8–23. https://doi.org/10.1016/j.techsoc.2017.06.002.

Tariq, A., Badir, Y., Chonglerttham, S., 2019. Green innovation and performance: moderation analyses from Thailand. Eur. J. Innovat. Manag. 22, 446–467. https://doi.org/10.1108/EJIM-07-2018-0148.

Teece, D.J., 2007. Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance. Strat. Manag. J. 28, 1319–1350. https://doi.org/10.1002/smj.640.

Teece, D.J., 2018a. Business models and dynamic capabilities. Long. Range Plan. 51, 40–49. https://doi.org/10.1016/j.lrp.2017.06.007.

Teece, D.J., 2018b. Dynamic capabilities as (workable) management systems theory. J. Manag. Organ. 24, 359–368. https://doi.org/10.1017/jmo.2017.75.

Teece, D.J., Pisano, G., Shuen, A., 1997. Strategic management. Strateg. Manag. 18, 77–115. https://doi.org/10.1007/978-1-137-03545-5.

Tsai, C.C., 2012. A research on selecting criteria for new green product development project: taking Taiwan consumer electronics products as an example. J. Clean. Prod. 25, 106–115. https://doi.org/10.1016/j.jclepro.2011.12.002.

Tseng, C.H., Chang, K.H., Chen, H.W., 2019. Strategic orientation, environmental innovation capability, and environmental sustainability performance: the case of Taiwanese suppliers. Sustain. Times 11. https://doi.org/10.3390/su11041127.

Ulrich, K.T., Eppinger, S.D., 2012. Diseño y desarrollo de productos, Quinta edi. McGraw Hill Education, México.

Van Hoof, B., 2014. Organizational learning in cleaner production among Mexican supply networks. J. Clean. Prod. 64, 115–124. https://doi.org/10.1016/j.jclepro.2013.07.041.

Vickers, I., Cordey-Hayes, M., 1999. Cleaner production and organizational learning. Technol. Anal. Strat. Manag. 11, 75–94. https://doi.org/10.1080/095373299107591.

Volberda, H.W., 1999. Chapter 6: the organization design task: reducing organizational barriers. In: Online, O.S. (Ed.), Building the Flexible Firm: How to Remain Competitive, pp. 1–68. https://doi.org/10.1093/acprof.

Wang, W., Zhang, C., 2018. Evaluation of relative technological innovation capability: model and case study for China's coal mine. Resour. Pol. 58, 144–149. https://doi.org/10.1016/j.resourpol.2018.04.008.

Wang, C.H., Lu, I.Y., Chen, C.B., 2008. Evaluating firm technological innovation capability under uncertainty. Technovation 28, 349–363. https://doi.org/10.1016/j.technovation.2007.10.007.

Wang, J., Wan, Q., Yu, M., 2020. Green supply chain network design considering chain-to-chain competition on price and carbon emission. Comput. Ind. Eng. 145, 106503. https://doi.org/10.1016/j.cie.2020.106503.

Wee, Y.S., Quazi, H.A., 2005. Development and validation of critical factors of environmental management. Ind. Manag. Data Syst. 105, 96–114. https://doi.org/10.1108/02635570510575216.

Weerts, K., Vermeulen, W., Witjes, S., 2018. On corporate sustainability integration research: analysing corporate leaders' experiences and academic learnings from an organisational culture perspective. J. Clean. Prod. 203, 1201–1215. https://doi.org/10.1016/j.jclepro.2018.07.173.

Wu, C.Y., 2014. Comparisons of technological innovation capabilities in the solar photovoltaic industries of Taiwan, China, and Korea. Scientometrics 98, 429–446. https://doi.org/10.1007/s11192-013-1120-7.

Wu, C.Y., Hu, M.C., 2015. The development trajectory and technological innovation capabilities in the global renewable energy industry. Portl. Int. Conf. Manag. Eng. Technol. 2015-Septe 2574–2580. https://doi.org/10.1109/PICMET.2015.7273069.

Xu, J.Z., Wang, M.M., 2018. Empirical research on green innovation capability evaluation of China's manufacturing enterprises based on principal component and cluster analysis. Int. Conf. Manag. Sci. Eng. - Annu. Conf. Proc. 2017-Augus 304–312. https://doi.org/10.1109/ICMSE.2017.8574432.

Yam, R., Guan, J.C., Pun, K.F., Tang, E.P.Y., 2004. An audit of technological innovation capabilities in Chinese firms: some empirical findings in Beijing, China. Res. Pol. 33, 1123–1140. https://doi.org/10.1016/j.respol.2004.05.004.

Yang, D., 2019. What should SMEs consider to introduce environmentally innovative products to market? Sustain. Times 11. https://doi.org/10.3390/su11041117.

Yogananda, A.P.Y., Nair, P.B., 2019. Green food product purchase intention: factors influencing Malaysian consumers. Pertanika J. Soc. Sci. Humanit. 27, 1131–1144.

Yong, J.Y., Yusliza, M.Y., Ramayah, T., Fawehinmi, O., 2019. Nexus between green intellectual capital and green human resource management. J. Clean. Prod. 215, 364–374. https://doi.org/10.1016/j.jclepro.2018.12.306.

Zhang, B.Y., Li, J., 2019. Design for environmental protection: measuring the appeal factors of green product for consumers. Ekoloji 28, 1699–1707.