ESG LAW REVIEW
ENVIRONMENT SOCIAL GOVERNANCE
Alumni.in
e-ISSN: 2965-2618
OPEN ACCESS
e-ISSN: 2965-2618 v.6, n.1, 2023

DRIVING COMPETITIVE ADVANTAGE IN CLEANTECH COMPANIES: A MODEL OF SMART REGULATION, ORGANIZATIONAL AGILITY, AND TECHNOLOGICAL INNOVATION

[1]Matheus E. S. de Noronha
[2]Juliano B. N. Martins
[3]Tamires Lietti
[4]Rosemeire de S. V. Silva

ABSTRACT

Context: Organizational environments have undergone major changes in the face of technological innovation advances in the industrial sectors. Looking at this context, technology startups have used increasingly technological and digital resources to delivery services and products with low or zero impact to the environment.

Objective: The paper aims to present a propositional model that encompasses the theoretical lenses of Organizational Agility (OA) by boosting Diffusion of Technological Innovation (DTI) in companies and clean technology to obtain Competitive Advantage (CV).

Methodology: A multiple case study with a qualitative approach was carried out with Cleantech organizations, supported by 22 semi-structured interviews from 17 clean technology companies in the areas of renewable energy, energy efficiency and commercialization in addition to water treatment. The results were supported by the content analysis technique.

Results: The AO can potentialize the DTI to achieve competitive advantage. Behind this, new categories were founded in this research: Agile Culture Values as a background for Digital Transformation to create a Smart Regulation to promote technological innovation in products and services at companies with sustainable solutions.

Contribution: This article contributes with a new model matching by the perspective of OA modify the positioning of managers and founders, to amplify the diffuser scenario of innovation and technology in the organization, reverberating in new market positions. The scientific contribution lists a research program based on the emerging categories of work, flowing into advances in the research field of Cleantech Organizations.

Keywords: Cleantechs, organizational agility, technological diffusion, competitive advantage.

Received: 08/09/2022
Accepted: 02/02/2023
DOI: https://doi.org/10.37497/esg.v6i1.1595

[1] ESPM - Escola Superior de Propaganda e Marketing, São Paulo (Brazil). Orcid: https://orcid.org/0000-0003-4640-6690 Email: math.euriconoronha@icloud.com

[2] ESPM - Escola Superior de Propaganda e Marketing, São Paulo (Brazil). Orcid: https://orcid.org/0000-0002-0524-5520

[3] Shanghai Jiao Tong University, Shanghai (China). Orcid: https://orcid.org/0000-0002-6475-6435

[4] ESPM - Escola Superior de Propaganda e Marketing, São Paulo (Brazil). Orcid: https://orcid.org/0000-0002-6260-6724

IMPULSIONANDO A VANTAGEM COMPETITIVA EM EMPRESAS DE TECNOLOGIA LIMPA: UM MODELO DE REGULAÇÃO INTELIGENTE, AGILIDADE ORGANIZACIONAL E INOVAÇÃO TECNOLÓGICA

RESUMO

Contexto: Os ambientes organizacionais têm sofrido grandes mudanças em face aos avanços de inovação tecnológica dos setores industriais. Observando este contexto, startups de tecnologia têm utilizado recursos cada vez mais tecnológicos e digitais para entregar serviços e/ou produtos com baixo ou zero impacto ao meio ambiente.

Objetivo: O objetivo do artigo é apresentar um modelo propositivo que abarca as lentes teóricas de Agilidade Organizacional (AO) impulsionar a Difusão de Inovação Tecnológica em empresas de tecnologia limpa para obtenção de Vantagem Competitiva.

Metodologia: O objetivo de apresentar um estudo de caso múltiplo com uma abordagem qualitativa foi realizado com organizações Cleantech, apoiado por 22 entrevistas semiestruturadas de 11 empresas de tecnologia limpa que trabalham na área das energias renováveis, eficiência e comercialização de energia além de tratamento de água. Os resultados foram apoiados pela técnica de análise de conteúdo.

Resultados: Os resultados são elencados no modelo propositivo para viabilização das Cleantechs em assumir e difundir inovação tecnológica possibilitando soluções sustentáveis de baixo ou zero impacto ao meio ambiente a partir de uma resposta ágil ao ambiente organizacional.

Contribuição: A AO modifica o posicionamento de gestores e fundadores, para amplificar o cenário difusor de inovação (DTI) e tecnologia na organização, reverberando em novas posições no mercado. A contribuição científica elenca uma agenda de pesquisa com base nas categorias emergentes do trabalho, fluindo em avanços no campo de pesquisa das organizações Cleantechs.

Palavras-chave: Cleantechs, agilidade organizacional, difusão tecnológica, vantagem competitiva.

1| INTRODUCTION

Organizations have been challenged to deal with environments of high technological intensity and procedural dynamism (Sherehiy, Karwowski & Layer, 2007). In this course, researchers study different types of organizations to understand predominant practices designed to establish greater competitiveness. Among these practices, Organizational Agility (OA) with the application of technology can be a strong ally for companies that seek to react quickly in competitive environments, aiming to support differentials through their capabilities and business resources (Zitkiene & Deksnys, 2018; Harraf et al., 2015).

In this aspect, the OA through the lens of the authors Zitkiene and Deksnys (2018) can be defined by recognizing scenarios of rapid changes, its characteristic stands out for reconfiguring internal resources and responding adequately to obtain competitive advantages. This reconfiguration reflects personal skills, learning, and experience resulting from constant training in organizations (Goldman et al., 1995).

The technological advances attributed to companies have the potential to boost business speed, promoting globalization and modernity for the capture of innovations in the industrial context (Doyle, Garrett & Currie, 2014; Tornatzky & Fleischer,1990). To target organizations' strategies, it is necessary that enterprise planning considers the capabilities of the organization in resource management and technology allocation in a transversal and diffuse manner. Thus, the diffusion of technology depends on the adequacy of best practices for the elaboration of new strategies in the technological context (Stoneman & Diederen, 1994).

In this sense, diffusion of technological innovation (DTI) can be characterized by the communication of innovation and its guidelines within a social system, such as: innovation, communication, time, and social system (De Guimarães, Severo & Dorion, 2022; Vargo, Akaka &

Wieland, 2020). The diffusion process goes through different organizations, in the approach of Cleantechs (Clean Technology Companies), considering the creation of a product and insertion of value in technologies of low and / or zero environmental impact, this companies use the different technologies for creating innovations, which are: Internet of Things (IoT), Machine Learning, Big Data and Blockchain (De Guimarães, Severo & Dorion, 2022; Wang et al., 2019; Shakeel, 2021; Pernick & Wilder, 2007).

The recurrent adaptations of companies in search of Competitive Advantage (CV) are visualized as the recognition acquired by their buyers by creating value in products or services exceeding costs to position themselves ahead of their competitors (De Guimarães, Severo & Dorion, 2022; Porter, 2003). In this way, Cleantechs seek insertion and subsequent traction in the market with its sustainable business models combined with a technological structure, delivering a differential in its sector of operation.

Within all contextualization on AO, DTI, and CV, this research is inserted into the context of Cleantech organizations, in which it aims to fill the theoretical gaps based on the findings of Vargo, Akaka and Wieland, (2020) and Ravichandran (2018) in which they emphasize the need to verify the application of DTI and AO in technological and innovative business models that are in market trends.

In addition, other gaps may be interpreted based on the structure of the present paper. According to Bjornali and Ellingsen (2014) and noted by Noronha et al. (2022), the factors that affect the development of clean technology startups and renewable energies to obtain CV are not well listed. Based on this, it is necessary to verify the profiles of managers and founders of clean technology companies; analyze the business model of startups in this segment and verify the restructuring of the startup in the market.

Based on the referential context presented, the research question that guides this paper is *"How does OA drive DTI to obtain CVs in cleantech companies?"* To answer the research question of the article, the objective of this paper is to present a propositional model that encompasses the theoretical lenses of OA by boosting DTI in clean technology companies to obtain CV.

The scientific contribution lies in presenting how organizations can restructure their business, through OA, boosting the DTI that generates CVs in the market, in addition to developing and disseminating sustainable innovations and technologies. Additionally, the emergence of Emerging Categories (EC) during the analysis path reflects the theoretical results for the development of traction and business scalability: Digital Transformation, Smart Regulation and Agile Culture Values. The practical contribution is directed to Cleantech companies, to enable innovation and technology directed to entrepreneurs, governments, and universities.

2| THEORETICAL BACKGROUND

The theoretical framework of the article has theoretical lenses of the sciences of management and economics. Thus, theoretical research lenses (a) Organizational Agility, (b) Diffusion of Technological Innovation and (c) Competitive Advantage were used as theoretical lenses. These lenses provided reference support for the creation of propositions and analytical categories that supported the methodological path of work development.

2.1 | Organizational agility and technological context

The problem of organizations dealing with unpredictable and dynamic environments has been predominantly studied for the development of competition in the industry (Sherehiy, Karwowski & Layer, 2007). According to Goldman et al. (1995), the definition of agility reflects the articulation between personal skills, knowledge, and experience, connected to the workforce and investments in constant training in the company.

For Jackson and Johansson (2003), organizational agility is defined in four dimensions: Ability to change the product, in which they are strategies directed to the company's product changes; Operational changes, departing from competencies, tools, and methods within the organization; Internal and external cooperation, attributed to the communication of the organization between all the personal sphere, starting from employees, suppliers, and customers; People, knowledge, and

creativity, is the application of knowledge and skill of employees as the basis of actions in the environment of change.

According to the analysis of Sherehiy, Karwowski and Layer, (2007), OA can be achieved from the actions of people, as opposed to what has been proposed for past studies in relation to technology. In parallel, Dyer and Shafer (2003) proposed the workforce as the key needed to build the OA (Goldman et al.,1995; Jackshon & Johansson, 2003). According to Harraf et al. (2015), OA is not a matter of choices in organizations and should be interpreted as an inherent characteristic of the process of gaining competitive advantages. For the authors the definition is permeated on the following bases: Culture of Innovation, Communication, Value and Vision.

The technological perspective of Ravichandran (2018) defines OA in three dimensions: Customer Responsiveness, when responding to the customer's offer of products and/or services; In sequence, Operational Flexibility, on improving the speed of production and distribution; And Strategic Flexibility, by identifying new markets and redefining the scope of the business. According to the conclusion of Ravichandran (2018), innovation and its technologies directly affect agility in the organization generating performance in the company.

In the analysis of Zitkiene and Deksnys (2018), OA is defined as recognizing unexpected changes and responding adequately quickly, and efficiently, reconfiguring internal resources to obtain competitive advantages, however, proposes to invest in the unification of the concept of OA due to multidimensionality as it applies to several different organizations. In the proposal assumed by Zitkiene and Deksnys (2018), a model is constructed from the general concepts updated and addressing them as guidelines for the achievement of AO, flowing from guidelines that are treated as research categories to investigate the context of the present work and are explained below:

- **Agility Drivers:** It's consumer preferences, market, competition, and social factors.
- **Agility Facilitators:** These are the characteristics that the organization needs to have to deliver change, such as Processes, Technology, Human Resources, and Network.
- **Agility Capacitors:** It is the answer in an agile way and is described as a sense of detection and a sense of reaction in the changing environment.

Based on the theoretical proposals of the studies by Zitkiene and Deksnys (2018), OA model was proposed by authors, for a concept standardization in face of the vast reviews found in the literature. It’s the most congruent theoretical lens to the approach in the present work, contextualized in the diffusion of innovation in Cleantechs and that response to obtaining the competitive advantage (Goncalves, et al., 2020; Pernick & Wilder, 2007; Shakeel, 2021).

2.2 | Diffusion of Technological Innovation

The theoretical basis for most research on technology adoption is found in the dissemination of literature on innovation that studies the process of technology diffusion and the factors that influence technology adoption decisions (Vargo, Akaka & Wieland, 2020; Tornatzky & Klein, 1982; Rogers, 1983).

According to Tornatzky and Klein (1982), the process occurs during the development of technology, moving through the implementation and routinization of the business model. From Rogers's perspective (1983), the process of adoption of technology is seen in the time necessary for it to evolve to the next stage within the diffusion cycle. In this case, five characteristics of the technology that influence its diffusion are considered: relative advantage, compatibility, complexity, testability, and observability.

In addition to these characteristics, it is important to consider that, since companies are directly susceptible to changes razed by globalization and technological advances promoted in the modern scenario. The optimization of operations and products in seeking new strategies that directly adapt to the ideal business model for a company, in turn, depends directly on the innovation process, interpreted in different ways (Rogers, 1995; Tornatzky & Fleischer, 1990).

Much of the technology diffusion literature is focused on individual actions. According to

Tornatzky & Fleischer (1990), it is necessary to consider a larger context that involves other aspects of a business model, not just employees who work in the corporation (Stoneman & Diederen, 1994). Innovation and diffusion are symbiotic processes that involve context, products, and applied technology. An enterprise strategy would be linked to the ability to (a) make decisions and (b) manage and allocate resources in which technology should play a central role in both processes.

Still in the same direction, Rogers (1995) proposes a practical focus on the diffusion process in which he considers the myriad interactions that will occur between the agents involved in these processes. Thus, literature has dedicated itself to creating a structure of the course and practice to verify the process and interpret how new technologies are disseminated within an organization (Stoneman & Diederen, 1994; Dedrick & West, 2003; Tornatsky & Klein, 1982)

DePietro, Wiarda and Fleischer (1990) delimited the existence of two other elements within this process. The first refers to the organization and how its dynamics are influenced by the capacity for innovation, in addition to the communicational, intra-organizational, and control mechanisms.

The strategic decisions of a company in relation to new technologies are directly related to aspects of the industrial branch in which the organization is inserted. This includes competitive advantages, rivals, suppliers, and the changes that come followed by industrial cycles within a given branch (DePietro et al., 1990). This conceptual structure became known as TOE (Technology, Organization, Environment). It is a useful tool for interpreting the variables of the technology diffusion process and distinguishing organizational capacities and contexts.

Although these models have their particularities, the adoption and dissemination of technology within a company must necessarily be aligned with the compatibility of the actual technology and relative advantage under those technologies already used. Without this, the process is impaired, opening possibilities for more technological complexities that are not compatible rather than advantageous tools (Tornatzky & Klein, 1982).

2.3 | Diffusion of Technological Innovation as research qualitative approach

Diffusion of Technological Innovation (DTI) studies use approaches conducted by the authors Albagli and Maciel, (2004); Doyle, Garrett and Currie, (2014); Rogers (1995); Polyakov and Kovshun, (2021) of qualitative character. For this research we will use the approach of the seminal author Rogers (1995) on the perspective of the crucial steps for the process of technological diffusion, treating these steps as categoric analysis. These categories are: (1) Knowledge of Innovation, (2) Persuasion, (3) Decision, (4) Implementation of the Idea and (5) Confirmation. The concepts operated are delimited below and observed as categories to enable the analysis of the diffusion process within the context of this research.

(1) Knowledge of Innovation: Antecedent and primary stage of the dissemination of an idea and depends directly on the organization of human capital within the initiative. Within the scope, it is important to know before applying innovation, the time, communication channels, and the social system of the company (Albagli & Maciel, 2004).

(2) Persuasion: After examining the science of innovation possibilities, the focus is to persuade partners, members and clients about the effectiveness and benefits of the initiative (Lundblad, 2003). During this phase, there is concern about blocking objections and ensuring internal approval for support for the following stages.

(3) Decision: It is the total conviction of acquiring and/or implementing an idea. The complexity of this phase lies in the collection of data that can reduce the margin of error and solidly rationalize the decision-making process (Rogers, 1995).

(4) Implementation of the Idea: It is the phase most dependent on practical strategies that help make innovation part of the company's routine, ensuring that it is used efficiently to solve problems or promote new products generating a positive impact within and outside the institutional scope (Doyle, Garrett & Currie, 2014).

(5) Confirmation: It is the guarantee that innovation continues to favor the business model and achieve effectiveness in its dissemination.

2.4 | Competitive Advantage: Price and Differentiation

The constant changes in current markets and the competition in large volume puts in check the success or failure of any company. In studies conducted by Porter (1989), he defined Competitive Advantage (CV) as the company's ability to create value in products and/or services for its buyers, and that exceeds the cost of fabrication of its product and cannot be implemented by potential or current competitors.

In parallel to the interpretation, Besanko et al. (2007) builds the narrative of value perception and understand that competitive advantage is the surplus of acquisition, that is, the acquisition by the benefit brings competition in the market as what buyers are willing to pay for what the company comes to offer depending on its added value. In addition, the CV for Ito et al. (2012) is exposed in the value chains, which presents the flow traveled until reaching the final product and delivering to the buyer the value determined by the company in its production.

In the field of strategic management, the fundamental concept of CV, according to Porter (1989), focuses on two basic strategies: (i) Price Leadership, in which to operate with low production costs and meet multiple industrial segments transcribing greater profitability and (ii) Differentiation, being unique with characteristics in its segment, visualized by its buyers, for example, durability, technical assistance, parts available among others. In addition, Porter (1989), cites the practice of the premium price to the company that brings differentiability in its market, that is, a reward for being unique.

The presence of Price Leadership can be observed in a company that performs distribution with low cost, a process of selling the highly profitable, or even an assembly line with very low margins of errors or defects. In parallel, differentiation translates into high-quality raw materials and even the generation of Organizational Agility.

Obtaining CV is interconnecting to the technological context and can allow cost reduction and intensify differentiation at the same time, due to its presence in the production chain and value generation in the product and/or service (Porter, 1989). To the detriment of the context addressed in the previous work, the vision established by Porter aligns with the objectives of the research relating to the diffusion of innovation to achieve (CV) in the environment of clean technology companies (Cleantechs) and how they present solutions that contribute to spreading innovation in the renewable energy sector.

3| PROPOSITION THEORETICAL MODEL

The basis for structuring the theoretical model offered is focused on the concept of critical rationalism, which, in turn, involves the idea that all scientific knowledge to be considered valid must be constructed and created by a hypothetical logic, from the perspective of a research question (Popper, 1985). The structuring of hypothetical models is based on the creation of scientific propositions, which can be confirmed or refuted based on empirical assumptions and explored on theoretical lenses that visualize scientific replicability (Silveira, 1996).

The theoretical model of propositions of this research is structured in order to explain the phenomena, appropriating theoretical references that led to the hypothetical qualitative logic of the research (O'Hear, 1997). In this sense, propositions were adopted to validate the conclusions and ensure the methodological-instrumental significance and replicability for the scientific community (Popper, 1990).

Since the model of this work is based on propositions, it is necessary to understand how they work inside the context of scientific research. Propositions aim to suggest a link between two concepts in a situation where this connection cannot be verified in previous literature. As a result, propositions rely heavily on previous research, semantic reference associations, reasonable assumptions, and correlative evidence. A scientist can use a proposition to stimulate more research on an issue or formulate ideas to find more evidence, or to make it a testable hypothesis (Coombs, 1995).

Figure 1 presents a model of propositions based on the theoretical lenses of Organizational Agility (OA), Diffusion of Technological Innovation (DTI) and Competitive Advantage (CV) that are

explained in detail in sections 3.1 and 3.2 of this work, analyzing the phenomenon investigated by articulating the reference bases.

Figure 1: Theoretical Proposition Model

3.1 | Organizational agility drives the diffusion of innovation

According to the literature, AO, the technological approach has the role of adherence to market changes in the current panorama by developing agility in the organization permeated in the flexibility and in the strategy adopted in its operations performed. The vision adapted to the new context of clean technologies compacts the vision reiterated in primary studies on the importance of the organization creating a strategy in the production and execution of services to promote technological diffusion (Polyakov & Kovshun, 2021; Ravichandran, 2018; Rogers, 1995; Wang et al., 2019).

Thus, from a scenario of market changes and consumer preferences in organizations and institutions, it is necessary to tie a strategy, which connects to the fundamentalism of the organizational social system, impacts the performance of collective actions in the operation of the company leading it to disseminate technology. This shall be done through the agility imposed by the personal culture of value, in the creation of new means and methods to manage the business operation (Sherehiy, Karwowski & Layer, 2007; Zitkiene & Deksnys, 2018).

According to the presence of phenomena linked to the panorama of the new cleantech industries (Shakeel, 2021; Rangel-Martinez, Nigam and Ricardez-Sandoval, 2021), in the present work, is discussed in the face of the suggestions made by Wang et al. (2019) and Mrugalska and Ahmed (2021) the systematic context of the presence of an organizational agility strategy to disseminate new technologies in Cleantech companies (e.g., Big Data, Artificial Intelligence, Machine Learning, Internet of Things) in the industry 4.0, for this, it is considered:

***Proposition 1**: Organizational agility drives the diffusion of technological innovation.*

3.2 | The diffusion of technological innovation from OA enables competitive advantage

In the guideline proposed by Porter (1989) to trace the basic concept of competitive advantage, which is established by the metrics of cost reduction and differentiation in the market, can be activated intensively by connecting with the technological context present in the organizational environment. At the same time, Zitkiene and Deksnys (2018) consider the competitive advantage as a point of arrival in the adoption of new strategies in the globalized and technological company, indirectly coming from the agility contrasted as a new foundation in their processes.

According to the approach of past studies by DePietro et al. (1990), by instilling the effects of new technologies and the diffusion process to gain market advantage, establishes a mutual bond of the relationship in the adoption of technologies, obtaining a competitive advantage with an overview of cost and differentiation in its services and/or products (Porter, 1989). Assuming through the theoretical basis referenced in the present work and in the research addressed, Proposition 2 of this work is rooted in the foundation that DTI through OA develops CV in Cleantech companies.

***Proposition 2**: The Diffusion of Technological Innovation allows the achievement of Competitive Advantage through Organizational Agility.*

4| METHODOLOGICAL APPROACH

The qualitative approach was adopted for this research, considering the exploratory character of data, and was based on the exploration of the social phenomenon of the unit characterized by its occurrence and the way it is related to external factors, considering the context of the phenomenon. Moreover, the exploration of this phenomenon little worked, allowing adherence to the exploratory character of the data (Casarin, 2012).

To achieve the proposed objective of this research, the multiple-combined case study method was adopted. The multiple case study method is an empirical examination of real-life phenomena, aiming to observe organizations (Godoy, 1995). This method enables the intense and extensive observation of social units, aiming to explain specific phenomena that result from everyday life.

The deepening seen by the multiple case study brought the contextuality of the object of study addressed Yin (2009), allowing the analysis of qualitative data from different contexts and scenarios, as well as generating evidence to answer the question "How" addressed in the research question of this study (Yin, 2009).

4.1 | Research Context: Cleantechs and the adoption of technology in the clean technology sector

Clean technology companies (i.e., Cleantechs or Clean Technology) have been selected as an analysis unit for this work and are organizations that in their internal processes, business models, materials, products, and technologies, help to minimize the impact on the environment. In these companies, this organizational articulation is done by encouraging the use of renewable sources, such as: wind energy, photovoltaics, and biofuels (Shakeel, 2021). From a similar angle, they hold any product, service, or process that can deliver value to the market using renewable resources, with low or zero impacts, even creating less waste than the industry average (Pernick & Wilder, 2007).

Cleantechs operates in different sectors of the industry: energy, transportation, raw materials, and construction, and several others (Shakeel, 2021). Cleantechs' differences from other companies in the same technology sector are based on how they position themselves to positively impact the environment. In addition, the implementation of current technologies such as Machine Learning, IoT, Big Data, and Blockchain collaborate with the advancement of sustainability within these companies, to create agility in the process and development of the diffusion of the technologies employed (De Guimarães, Severo & Dorion, 2022; Shakeel, 2021; Wang et al., 2019).

The justification for the scope of this research is part of the Brazilian context of Cleantechs and was supported based on the report "Mapping Cleantech 2021" of the Brazilian Association of Startups (ABSTARTUPS) that highlights in numbers the great growing number of clean technology startups. In Brazil, there are more than 102 active companies, present in 8 states, with 54% of them operating in the B2B market (i.e., sell or provide services to other companies); 44% of these companies are in the traction phase; 23% use SaaS as a model to generate revenue (Available in: https://abstartups.com.br/mapeamento-cleantech).

The Brazilian renewable[5] energy market evolves from the trends of the global scenario and according to the organization Cleantech Group and Smart Prosperity Institute, there are 11,000 cleantech startups that around the world and in 75 countries can move up to $2.5 trillion (Available in: https://www.cleantech.com/the-global-cleantech-100/). From this growing market with attracting global investors, we see the need to understand the mechanisms that affect the adoption of new technologies and the behavior performed to disseminate new examples of services and products, linked to the global panorama of sustainability.

[5] In a list of 40 countries, Brazil ranks 11th, being the leader in Latin America. The classification is made by the Index of Attractiveness of Countries in Renewable Energy (RECAI) and is based on the attractiveness of investments and opportunities for the deployment of renewable energy. Source: Abstartups, (2021).

4.2 | Analysis Unit Selection Criteria

The selection criterion of the sample for research analysis it's based on cleantech solutions focused on the development of new technologies, with a high volume of data and even making great use of Artificial Intelligence, Big Data, and algorithms (Rangel-Martinez, Nigam and Ricardez-Sandoval, 2021), based on this assumption the criteria adopted were:

(i) the company must be a Cleantech;

(ii) must have an organizational culture focused on innovation, following the premises of the theoretical framework of Organizational Agility;

(iii) the company adopts a technology presented in a distinctive way to disseminate innovations, following the premises of the Technological Innovation Diffusion framework.

4.3 | Sources and Instruments for Data Collection

The data used in this study was collected via interviews. The script was structured with questions to the interviewees based on the categorical block and their respective categories. Its adoption allowed a deeper understanding of the issues raised in the technological content of the present work and allowed the interviewees to contribute with their experiences in their organizations related to the research objective (Perovano, 2016).

The execution of data collection included 22 interviews with 17 companies linked to clean technology in the Energy (e.g., energy efficiency, management, and commercialization) and sanitation (e.g., monitoring and water waste) sectors. The predominant characteristic of the profile of the interviewees considered employees of Cleantech companies that worked with technology and innovation, including the phenomenon of this research. To preserve the interviewees' identities, the interviews were conducted anonymously.

4.4 | Data Analysis: Technique

The technique for analyzing data obtained qualitatively was through Content Analysis. This analysis was supported using NVivo software, which assisted in the process of transcription and inferences with the data collected by interviews. Content Analysis is a technique of textual analysis, visualizing qualitative communications, and is configured from categories that help in understanding the discourses extracted from interviews (Silva & Fossa, 2015).

To organize the results of the analysis, it was subdivided into two categorical types: deductive and inductive. The deductive categories are represented by the categories of the blocks of the theoretical framework, composed of Organizational Agility, Diffusion of Technological Innovation, and Competitive Advantage (Silva & Fossa, 2015). On the other hand, the inductive categories are determined based on the analysis performed, evidencing the research findings and their implications due.

The methodology of the analysis process was based on the studies of Mendes and Miskulin (2016) and includes the following steps: (i) data schematization and exploration, (ii) division of categories (deductive and inductive) on the perception of reference blocks, (iii) patterns of analysis delimitation, (iv) creation of tables, charts, and visual schemas to illustrate data and results.

To perform the analysis, we used the Data Triangulation Technique, as revered by Zappellini and Feuerschutte, (2015), which describes the permissiveness of the phenomenon under study, whether approached in different ways, or by means of multiple methods, periods, and based on different sources. This state of the triangular relationship between the data, strengthens the evidence, authenticating the proposition of the study. Based on these premises, triangulation was used between semi-structured interviews, reports and technical studies, and field observation notes (Stake, 2005).

5| DATA ANALYSIS: CONTENT ANALYSIS

This section presents the analysis of the content by block, from the transcriptions dialoguing with the theoretical framework and the number of the repetition of the different theoretical categories (N). The textual transcriptions resulting from the interviews were organized and the main statements of the interviewees were selected and listed in the table[6].

Content Analysis is dialogued below, divided into subsections: 5.1 Organizational Agility, 5.2 Dissemination of Technological Innovation, 5.3 Competitive Advantage addressing deductive categories. The next subsection, 5.4. Emerging Categories will address the inductive categories.

5.1 | Organizational Agility (AO)

The Organizational Agility block is analyzed in view of the decisive attitudes in Cleantech organizations, to bring speed and agility to the response of current market changes, seeking to develop solutions and propose internal changes in their processes, products, and services to obtain greater participation in their market (Harraf, 2015). Reinforcing, there are three concepts categorized and analyzed within this block: (a) Agility Drivers, (b) Agility Facilitators and (c) Agility Capacitors.

In (a) Agility Drivers (N= 13), according to the transcription made on the conduct of agility, the cost reduction of Cleantechs and the digital operation, delimits the ideal scenario to enter the agile cycle of the organization, due to the need for high investments in the technology sector and is the starting point to start inserting the culture in organization (Abstartup, 2021; Ravichandran, 2018). Moreover, the factor to drive OA is the strong presence in the digital environment, contrasted with the use of technologies to develop new attributes of the organization, being different in the clean technology scenario.

In (b) Agility Facilitators (N=35), the great use of current technologies, such as Big Data and 5G, as reported by the interviewee, evidences the driving force that generates speed and speed in organizational processes. These technologies are the cover of redistributing the organization's processes in an automated way and enhance daily operations, conferring the necessary step to facilitate the permeabilization of agility in Cleantechs, opening other focuses for managers, and contributing to the spread of new technologies (Shakeel, 2021; Wang et al., 2019).

In (c) Agility Capacitors (N=29), we found the second-highest repetition (N), characterized by the preparation of the position in the Cleantechs market, resulting in response to the demand of the sector, through the resolution of problems and delivery of the result to the client, as reported in the transcription. Finally, the use of technologies to reduce losses or process improvements is congruent to the point of view reported by the interviewee, in which it generates a positive impact on the sector generating competitive solutions (Ravichandran, 2018).

5.2 | Organizational Agility (AO)

This block will examine how the process of propagating technological innovation has behaved in Cleantech organizations. Its division is according to the aforementioned methodology: (i) Knowledge in innovation, (ii) Persuasion, (iii) Decision, (iv) Implementation of the Idea and (v) Confirmation.

In the category (i) Knowledge in innovation(N=12), it was observed the primitive taking of knowledge in innovation in transcriptions from the digitization of operations, visualized in the decentralization of physical equipment and resources. This knowledge is obtained, according to the interviewees, in the way of improving the conduct of their operations, creating agility, and consequently knowing innovative ways.

In (ii) Persuasion, (N=13), based on the transcription, respondents face the challenge of being able to persuade new customers through the savings generated by intelligent tariff

[6]The table 1 with reports and other data is available in the:
https://drive.google.com/file/d/1qvR4DmaPXfbjUXsFDWrHfe-2pJXTXTpN/view?usp=sharing

management systems, which is beneficial to some business models. Moreover, the change cited, is an innovative way, due to the long procedures in the management of electricity throughout the industry.

In (iii) Decision, (N=15), similarly to (i) and (ii), the repetition of the category was raised, based on the studies pointed out by the interviewees of cleantech organizations in the use of technologies such as Artificial Intelligence and its predictive models. These topics have become relevant to the category, to understand the behavior of the organization in studying new ways to use technology and expand the new processes of data collection, moving towards the dissemination of innovation.

In category (iv) Implementation of the Idea, (N=26), it demonstrates the monitoring of the implementation of innovation, based on the steps taken from the previous stage, (iii) Decision. As investments were made in certain areas of the energy sector, new investments in technology were proposed, fostering new activities and products linked to the existing business model. At this moment, the largest repetition of the block is visualized, concluding the greatest relevance of the result of the implementation of the idea.

To close the block, in (v) Confirmation (N=35), presents the innovation in Cleantech organizations. Innovation is presented in the mode of electric power generation reformulating the sector (e.g., Wind Energy and Photovoltaic Solar); in reducing losses in sanitation; process management; channel of sale of its services, through the use of current technologies (i.e., Big Data, 5G, Artificial Intelligence, Blockchain and Internet of Things), promoting the achievement of the best result, both for the organization and for its customers.

5.3 | Competitive Advantage (CV)

The block analyzes the data of the Competitive Advantage, resulting from the decision-making of the strategic management of Cleantech, to lead them to a competitive position in the market, delivering products and/or services with aggregate value, obtaining new business opportunities (Ito et al., 2012; Porter, 1989). Based on this, CV has its delimitations in two concepts: (1) Price and (2) Differentiation.

In (1) Price (N=35), a high repetition was detected, characterized by the transcription addressing the pricing of tariffs and other values at the service of electricity, demonstrating the importance of technological monitoring (i.e, Smart Metering) of prices passed on the consumer. The competitive advantage panorama tied to the price is corresponding to operating costs and the added value in the acquisition, however, is taken by competitiveness among the other Cleantechs by providing a value that exceeds the cost barrier, that is, effective service with transparency and adherence to current technologies.

In (2) Differentiation (N=29), in the transcription of this category, it is observed the need for communication and transparency of Cleantech organizations in the provision of information relevant to the service provided, and through the placements of the interviewees, it is evident the lack of commitment to the final client. Understanding these needs is crucial to the construction of the organization's innovative profile for delivering added value in exchange, represented by the concept of differentiation in the market (Pernick & Wilder, 2007).

5.4 | Emerging Categories (EC)

The Emerging Categories are the research findings, that is, that appeared and emerged during the process of analysis of transcriptions in the treatment phase of the data of the interviews. They were categorized within the block into three:

> *(I) Digital Transformation*, highlighting the use and adoption of current technologies (e.g. Big Data, 5G, Artificial Intelligence, Blockchain and Internet of Things) reformulating their operational processes through these technologies;
>
> *(II) Agile Culture Values*, visualized human resources as part of the organization's Agile

Culture; and

(III) Smart Regulation, an apparent market regulation to move the new demand for centralized electricity in large urban centers, through clean energies.

Category (I) Digital Transformation (N=12) according to the interviewees' reports, is part of a new panorama through the digitization of the energy sectors in their areas: generation, transmission, distribution and commercialization, and sanitation (e.g., mitigation of losses and waste in water transport). In addition, Digital Transformation, according to the respondents, guarantees transparency to all those involved in operations (Furr, Ozcan and Eisenhardt, 2022).

In (II) Agile Culture Values (N=26), it was present in most of the interviewees' reports, characterizing the high agile power of Cleantech organizations, through their strategic choices to automate their tasks, processes, and services. In addition, they address the adherence of pe to agile culture in the basic spheres of the organization in the scope of Cleantechs, that is, reduction of impact on the environment through technology.

In (III) Smart Regulation (N=23), we see the adoption of a new operation of the electric energy market for individuals, to improve the supply and the power of choice of consumers, bringing a new panorama to the innovative electricity sector, expanding beyond the free energy market, which is restricted only to large generators.

6| RESULTS AND DISCUSSIONS

During the content analysis in the previous section, there are categories that were more expressively evidenced than others. Through this, figure 2 presents the visualization of type Bars, marked by Repetition (N) versus Blocks and Categories. The results commented are in the paragraphs below, as well as the discussion of the research findings.

Figure 2: Categories versus Repetition

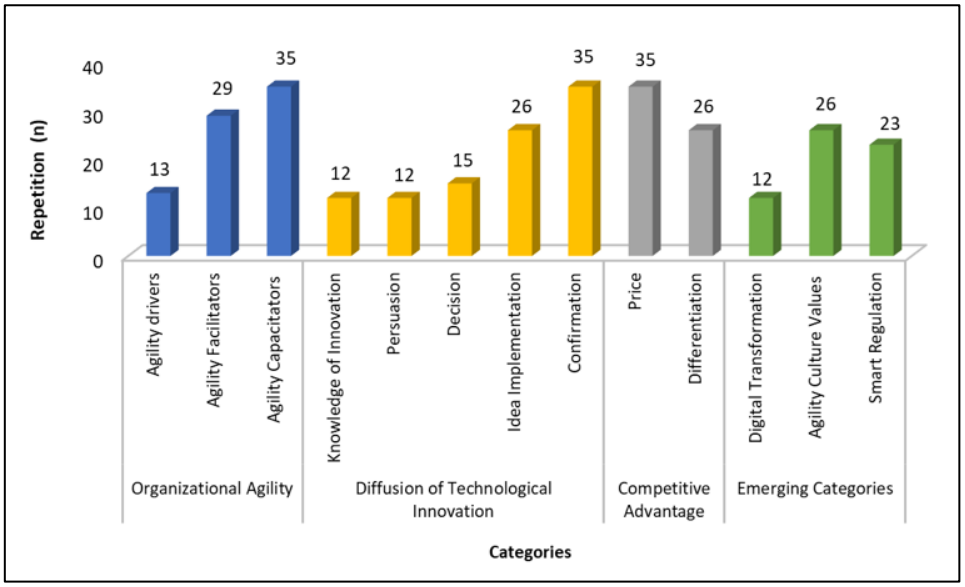


Figure 2 shows OA with higher repetitions in Agility Capacitors, in view of the sense of detection and response as the greatest feature of Cleantechs management. This representativeness is evidenced in the theoretical lenses of Zitkiene and Deksnys, (2018); Wang et al., (2019); Ravichandran (2018) that address the sense-response as a principle inherent to OA, as well as how to use technologies for innovation, and contribute to their dissemination. This justification is aligned in meeting Proposition 1 of this work.

The DTI is presented with low repetition in (i) Knowledge in innovation, (ii) Persuasion, (iii) Decision, representing the early stages of innovation and being more evident with greater incidence in the other two concepts (iv) Implementation of the Idea and (v) Confirmation, permeated by Cleantechs in the process of finalizing the scope of its business (Abstartups, 2021; Rogers, 1995; Tutida et al. 2022).

The CV was very evident in the overall picture of (1) Price, with a slight discrepancy to (2) Differentiation, being represented scientific evidence Rogers (1995); Porter, (1989) to position himself in the face of market changes and their predominance in the market. These changes in the economic situation from the point of view of DTI are also addressed by authors De Guimarães, Severo and Dorion (2022); Zitkiene and Deksnys, (2018); Wang et al (2019); Ravichandran (2018), and are worked in a triangular way in the validation of Proposition 2 of the present study.

In order for OA to boost DTI, with the aim of obtaining CV it is necessary to have the following concepts that emerged in the data analysis process: a Digital Transformation in cleantech organizations Vial (2021), as well as a Smart Regulation of the electricity market (Davydova & Makarov, 2020; Gunningham & Sinclar, 2017; Van Gossum, Arts & Verheyen, 2010) followed by the adoption of new Agile Culture Values in recruitment and selection to join people with the same mentality and cultural harmony (Felipe, Roldán, Leal-Rodríguez, 2017).

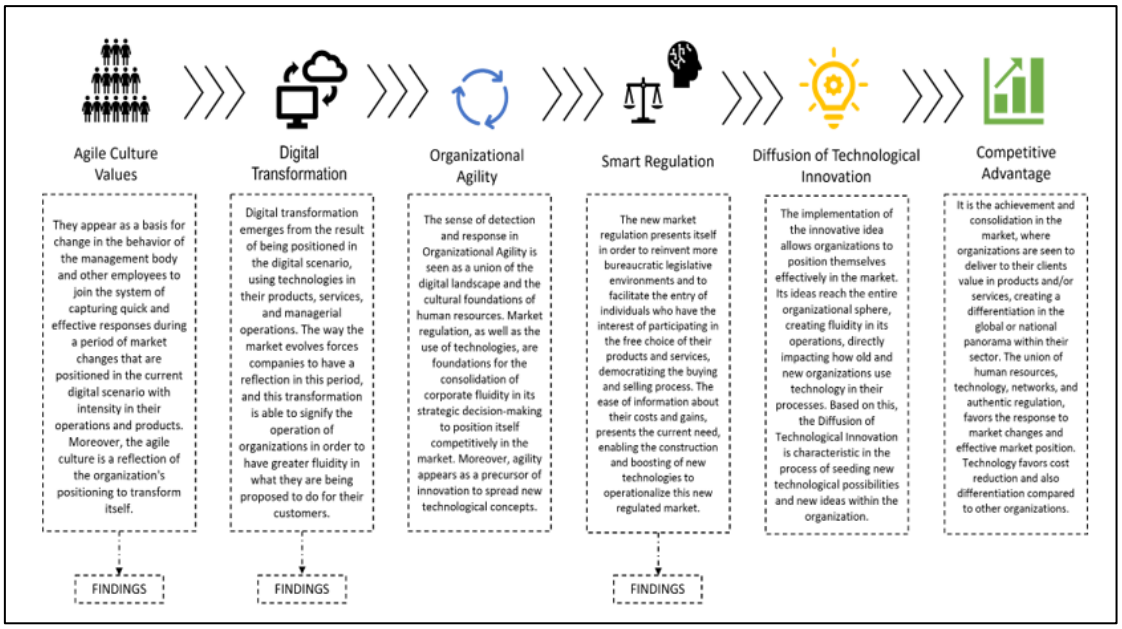
Digital Transformation can digitize the operations of Cleantech organizations, making the use of current technologies, such as Big Data, 5G, Artificial Intelligence, Blockchain and Internet of Things, make a participation with the management and operationalization of services in order to effect Organizational Agility as agility facilitators (Furr, Ozcan & Eisenhardt, 2022; Shakeel, 2021; Zitkiene & Deksnys, 2018; Wang et al., 2019). In addition, Smart Regulation characterizes the market and regulatory scenario as the ideal background to start a new cycle of energy purchase and sale, stimulating the Diffusion of Technological Innovation.

6.1 | Organizational Agility Model for achieving Competitive Advantage through the Diffusion of Technological Innovation

The model below in Figure 3 illustrates the results of the research, emphasizing OA by boosting DTI, to obtain CV in the context of Cleantech organizations, with the findings represented by Digital Transformation, Smart Regulation and Agile Culture Values. In order to present and illustrate how the behavior of the categories occurred, it brought an illustrative model to represent the way the OA through the DTI, effective to CV in the market, answering the research question of this work.

The elaboration of the model covers theoretical lenses of strategic administration and economics. However, it is worth noting that this model is appropriate for other contexts of other types and organization, expanding the use to other areas of research. It is of great interest that researchers seek to bring new depths to the areas linked to the research findings.

Figure 3: Organizational Agility Model for achieving Competitive Advantage through the Diffusion of Technological Innovation



7|FINAL CONSIDERATIONS

The data analysis of the interviews showed some elementary results for the fulfillment of the research objective and that will be presented in this section. These results refer to the incidence of inductive and deductive categories and how they manifest with the literature. In addition, the research propositions were met, which include the theoretical lenses of AO that boosting DTI obtains CVs in the business environment of Cleantechs.

The deductive categories (OA, DTI, and CV) tied to the theoretical framework and the inductive categories (Agile Culture Values, Digital Transformation, and Smart Regulation) originating in the process of content analysis, complete the feasibility of Cleantechs' process in assuming and disseminating technological innovation allows sustainable solutions with low or zero impact to the environment. In addition, they are based by OA in modifying the positioning of managers and founders, to amplify the diffuser scenario of innovation and technology in the organization, reverberating in new positions in the market.

7.1 | Search Limitations and Suggestions for Future Research

The limitations of the research are related to the condition of the multiple case study method, which characterizes the specificity of the sample, thus limiting the results and interpretation of the study. This is said, it is recommended that future authors explore other methodologies in other data collection instruments, modifying the database still within the phenomenon explored (i.e., Cleantech organizations).

Moreover, the future research agenda can be based on emerging categories and researchers may plot a new study based on what was visualized as found in this research: (1) Agile Culture Values, (2) Digital Transformation, and (3) Smart Regulation.

Another suggestion is to develop other studies on Cleantech organizations with quantitative methods based on other sectors of activity (e.g., transportation, water or, air and environment). Table 4 below exemplifies research questions suggested for other authors to draw up a new research agenda.

Table 4
Future suggestions for a research agenda

Findings	Questions for Futures Research
Agile Culture Values	How can the Agile Culture Values enhance Digital Transformation in the organization to obtain agile and fluid responses in management decision-making? Understand how the effects of the Values of Agile Culture can position the organization in the creation of Digital Capabilities using technologies and services in their operations?
Digital Transformation	Understand how Digital Transformation can help companies that do not have technologies in their business models to obtain competitive market positioning? To map out in the literature possible impacts that Digital Transformation can promote to enable the global positioning of Cleantech company?
Smart Regulation	How can Smart Regulation drive the delivery of innovative projects (i.e. wind energy, solar photovoltaic, green hydrogen and storage) in Cleantech companies to meet the new energy demand in the digital scenario?

7| REFERENCES

Albagli, S., & Maciel, M. L. (2004). Information and knowledge in innovation and local development. *Information Science*, *33*, 9-16. https://doi.org/10.1590/S0100-19652004000300002

Besanko, D. A., Doraszelski, U., Kryukov, Y., & Satterthwaite, M. A. (2007). Learning-By-Doing. Organizational Forgetting, and Industry Dynamics, Harvard Institute of Economic Research Discussion Paper, (2128). https://doi.org/10.2139/ssrn.962878

Bjornali, E. S., & Ellingsen, A. (2014). Factors affecting the development of clean-tech start-ups: A literature Review. *Energy Procedia*, 58, 43-50. https://doi.org/10.1016/j.egypro.2014.10.407

Coombs, J. (1995). Jeronimo Pardo on the necessity of scientific propositions. *Vivarium*, *33*(1), 9-26. https://doi.org/10.1163/1568534952579803

Davydova, M. L., & Makarov, V. O. (2020, March). Smart Technologies in Lawmaking: Towards the Concept of Smart Regulation. In *Institute of Scientific Communications Conference* (pp. 1296-1305). Springer, Cham. https://doi.org/10.1007/978-3-030-59126-7_142

De Guimarães, J. C. F. F., Severo, E., Dorion, E C H (2022). Product Innovation: Path to Sustainable Competitive Advantage with Use of Environmental, Social and Governance Principles Iberoamerican. *Journal of Corporate Governance* 9 (1), e 117. https://doi.org/10.21434/IberoamericanJCG.v9i1.117

de Noronha, M. E. S., Ferraro, D. M., Longo, L. R., & Melvin, S. S. (2022). The orchestration of dynamic capabilities in cleantech companies. *Innovation & Management Review* 1-13. https://doi.org/10.1108/INMR-08-2021-0144

Dedrick, J., & West, J. (2003, December). Why firms adopt open source platforms: a grounded theory of innovation and standards adoption. In *Proceedings of the workshop on standard making: A critical research frontier for information systems* (pp. 236-257).

DePietro, R., Wiarda, E., & Fleischer, M. (1990). The context for change: Organization, technology and environment: Lexington. *MA: Lexington Books*.

Doyle, G. J., Garrett, B., & Currie, L. M. (2014). Integrating mobile devices into nursing curricula: Opportunities for implementation using Rogers' Diffusion of Innovation model. *Nurse Education Today*, *34*(5), 775-782. https://doi.org/10.1016/j.nedt.2013.10.021

Dyer, L., & Shafer, R. A. (2003). Dynamic organizations: Achieving marketplace and organizational agility with people. *Laurence Erlbaum Associates*, Mahwah, NJ

Felipe, C. M., Roldán, J. L., & Leal-Rodríguez, A. L. (2017). Impact of organizational culture values on organizational agility. *Sustainability*, *9*(12), 2354. https://doi.org/10.3390/su9122354

Furr, N., Ozcan, P. & Eisenhardt, K. M. (2022). What is Digital Transformation? Fundamental Tensions faced by companies established in the World Scenario. Iberoamerican *Journal of Competitive Intelligence*, 12(1), e0410. https://doi.org/10.24883/IberoamericanIC.v12i.2022alumniin

Godoy, A. S. (1995). Qualitative research: fundamental types. *Business Administration Magazine*, *35*, 20-29. https://doi.org/10.1590/S0034-75901995000300004

Goldman, S., Nagel, R. and Preiss, K. (1995), Agile Competitors and Virtual Organizations, van Nostrand Reinhold, New York, NY.

Goncalves, D., Bergquist, M., Bunk, R., & Alänge, S. (2020). Cultural aspects of organizational agility affecting digital innovation. *Journal of Entrepreneurship, Management and Innovation*, *16*(4), 13-46. https://doi.org/10.7341/20201641

Gunningham, N., & Sinclair, D. (2017). Smart regulation. *Regulatory theory: Foundations and Applications*, 133-148. https://doi.org/10.22459/RT.02.2017.08

Harraf, A., Wanasika, I., Tate, K., & Talbott, K. (2015). Organizational agility. Journal of Applied Business Research (JABR), 31(2), 675-686. https://doi.org/10.19030/jabr.v31i2.9160

Ito, N. C., Hayashi Junior, P., Gimenez, F. A. P., & Fensterseifer, J. E. (2012). Value and competitive advantage: searching definitions, relationships and repercussions. *Contemporary Administration Magazine, 16*, 290-307. https://doi.org/10.1590/S1415-65552012000200008

Jackson, M., & Johansson, C. (2003). An agility analysis from a production system perspective. *Integrated Manufacturing Systems*. 14(6), 482-488. https://doi.org/10.1108/09576060310491342

Lundblad, J. P. (2003). A review and critique of Rogers' diffusion of innovation theory as it applies to organizations. *Organization Development Journal*, *21*(4), 50-64.

Mapeamento Cleantech. Associação Brasileira de Startups (ABSTARTUPS). (2022, February 11). Retrieved July 12, 2022, from https://abstartups.com.br/mapeamento-cleantech/

Mendes, R. M., & Miskulin, R. G. S. (2017). A análise de conteúdo como uma metodologia. *Cadernos de Pesquisa*, 47, 1044 -1066. https://doi.org/10.1590/198053143988

Mrugalska, B., & Ahmed, J. (2021). Organizational agility in industry 4.0: A systematic literature review. *Sustainability*, *13*(15), 1-23. https://doi.org/10.3390/su13158272

O'Hear, A., & Hesse, M. (1997). A Philosopher of Science and Humanism. Karl Popper: Philosophy and Problems. *Notes and Records of the Royal Society of London*, 51(2), 344-345.

Pernick, R., & Wilder, C. (2007). Cleantech. the clean boom at the stock exchanges. How green technologies change our lives-and how investors can take advantage out of it; Cleantech. Der saubere (Boersen) Boom. Wie"gruene"Technologien unser Leben veraendern-und wie Anleger davon profitieren (pp.1-443): Germany. German.

Perovano, D. G. (2016). Manual de metodologia da pesquisa científica. Curitiba: intersaberes.

Polyakov, M., & Kovshun, N. (2021). Diffusion of innovations as a key driver of the digital economy development. *Baltic Journal of Economic Studies*, 7(1), 84-92. https://doi.org/10.30525/2256-0742/2021-7-1-84-92

Popper, K. R. (1990). A world of propensities. Bristol, England: Thoemmes

Popper, K. R., & Amado, M. (1998). *Open society and its enemies* (pp. 267-89). Itatiaia.

Porter, M. (2003). Michael Porter (1947-). *Fifty Key Figures in Management*, 272. New York: NY.

Porter, R. (1989). Health for sale: quackery in England, 1660-1850. Manchester University Press.

Rangel-Martinez, D., Nigam, K. D. P., & Ricardez-Sandoval, L. A. (2021). Machine learning on sustainable energy: A review and outlook on renewable energy systems, catalysis, smart grid and energy storage. *Chemical Engineering Research and Design*, 174, 414-441. https://doi.org/10.1016/j.cherd.2021.08.013

Ravichandran, T. (2018). Exploring the relationships between IT competence, innovation capacity and organizational agility. *The Journal of Strategic Information Systems*, *27*(1), 22-42. https://doi.org/10.1016/j.jsis.2017.07.002

Rogers, E. M., & Williams, D. (1983). Diffusion of. *Innovations (Glencoe, IL: The Free* Press. New York: NY.

Rogers, E. M., Singhal, A., & Quinlan, M. M. (2014). Diffusion of innovations. In *An integrated approach to communication theory and research* (pp. 432-448). Routledge.

Shakeel, S. R. (2021). Cleantech: Prospects and Challenges. *Journal of Innovation Management*, *9*(2), 1-17. https://doi.org/10.24840/2183-0606_009.002_0002

Sherehiy, B., Karwowski, W., & Layer, J. K. (2007). A review of enterprise agility: Concepts, frameworks, and attributes. *International Journal of Industrial Ergonomics*, *37*(5), 445-460. https://doi.org/10.1016/j.ergon.2007.01.007

Silva, A. H., & Fossá, M. I. T. (2015). Análise de conteúdo: exemplo de aplicação da técnica para análise de dados qualitativos. *Qualitas Revista Eletrônica*, 16(1).

Silva, H. D. C., & Casarin, S. J. (2011). Pesquisa cientifica: da teoria a pratica. Curitiba: Ibpex.

Silveira, F. L. D. (1996). Karl Popper's philosophy of science: critical rationalism. *Santa Catarina's notebook for teaching physics*. Florianópolis. Vol. 13, n. 3 (Dec. 1996), p. 197-218. https://doi.org/10.2307/2234987

Stake, R. E. (2008). Qualitative case studies. In N. K. Denzin & Y. S. Lincoln (Eds.), Strategies of qualitative inquiry (pp. 119–149). *Sage Publications*, Inc.

Stoneman, P., & Diederen, P. (1994). Technology diffusion and public policy. *The Economic Journal*, *104*(425), 918-930.

Tornatzky, L. G., & Klein, K. J. (1982). Innovation characteristics and innovation adoption-implementation: A meta-analysis of findings. *IEEE Transactions on Engineering Management*, (1), 28-45.

Tornatzky, L. G., Fleischer, M., & Chakrabarti, A. K. (1990). *Processes of Technological Innovation*. Lexington books. https://doi.org/10.1109/TEM.1982.6447463

Tutida, A. Y., Rossetto, C. R., Santos , R. C. dos, & Mazon , G. (2022). Transformação Digital (TD): Uma

Visão Geral da Produção Científica Internacional na Última Década. *Revista Inteligência Competitiva*, 12(1), e0413. https://doi.org/10.24883/IberoamericanIC.v12i.2022.e0413

Van Gossum, P., Arts, B., & Verheyen, K. (2010). From "smart regulation" to "regulatory arrangements". *Policy Sciences*, *43*(3), 245-261. https://doi.org/10.1007/s11077-010-9108-0

Vargo, S. L., Akaka, M. A., & Wieland, H. (2020). Rethinking the process of diffusion in innovation: A service-ecosystems and institutional perspective. *Journal of Business Research*, 116, 526-534. https://doi.org/10.1016/j.jbusres.2020.01.038

Vial, G. (2021). Understanding digital transformation: A review and a research agenda. *Managing Digital Transformation*, 13-66. https://doi.org/10.4324/9781003008637-4

Wang, H., Huang, J., & Zhang, Z. (2019). The impact of deep learning on organizational agility. In proceedings of the 40th International Conference on Information Systems (ICIS), Munich, Germany.

Yin, R. K. (2015). *Case Study: Planning and methods*. Bookman editor. Porto Alegre: Bookman.

Zappellini, M. B., & Feuerschütte, S. G. (2015). O uso da triangulação na pesquisa científica brasileira em administração. Administração: ensino e pesquisa, 16(2), 241-273.

Zitkienė, R., & Deksnys, M. (2018). Organizational agility conceptual model. *Montenegrin Journal of Economics*, 14 (2) (2018), 115-129. https://doi.org/10.14254/1800-5845/2018.14-2.7

Authors Biographies

Matheus Eurico Soares de Noronha - Escola Superior de Propaganda e Marketing (ESPM)
PhD candidate in Management and International Business at ESPM (Escola Superior de Propaganda and Marketing/Brazil). Master's degree in Consumer Behavior at ESPM (ESPM/Brazil) and Bacharel in Marketing at Universidade Presbiteriana Mackenzie (Mackenzie/Brazil). MBA at Católica Porto Business School (CPBS/Portugal). Professional experience in the renewable energy sector, specifically in the wind energy industry in the areas of communication, strategy, and innovation. Scientific Researcher in Innovation, strategy, and international business.
ORCID: https://orcid.org/0000-0003-4640-6690
E-mail: math.euriconoronha@icloud.com

Juliano Barros Neves Martins - Escola Superior de Propaganda e Marketing (ESPM)
Master's degree candidate in Administration at ESPM (Escola Superior de Propaganda and Marketing/Brazil) and Bacharel in Chemical Engineering at Universidade Santa Cecília (UNISANTA/Brazil). Professional experience in the renewable energy sector at technical and regulatory area in the wind energy industry. Scientific Research in Engineering, Economy and Strategy and International Business.
ORCID: https://orcid.org/0000-0002-0524-5520
E-mail: juliano.barros@hotmail.com

Tamires Lietti - Shanghai Jiao Tong University
Master in Communication and Social Media with Shanghai Jiao Tong University, China (SJTU) and senior Journalist graduated from Universidade Presbiteriana Mackenzie (Mackenzie/Brazil). Professional editor, copywriter and translator with four years of experience in the Chinese market and two years of actuation in the European market. Scientific researcher in innovation and cultural resources.
ORCID: https://orcid.org/0000-0002-6475-6435
E-mail: liettilippi@gmail.com

Rosemeire de Souza Vieira Silva – Escola Superior de Propaganda e Marketing (ESPM)
PhD candidate in Management and International Business at ESPM (Escola Superior de Propaganda e Marketing/Brazil). Master in Consumer Behavior from ESPM (ESPM/Brazil) and bachelor's in business administration from Faculdade Instituto Superior de Ensino Alvorada Plus (Adventista/Brazil). Professional experience in an educational institution and multinational company in planning, budgeting, and cost reduction. Scientific researcher in the line of strategy, innovation, and business.
ORCID: https://orcid.org/0000-0002-6260-6724
E-mail: rose.v.silva@hotmai.com