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The Relationship between Eco-Innovation and Smart Working as Support for Sustainable Management

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Abstract: Nowadays, firms have to face challenging economical cirses, like the one caused by the COVID-19 pandemic, where volatility, uncertainty, complexity, and ambiguity are manifested. Strategic management is seen as one of the key approaches that firms can choose to implement sustainable smart working (on the support of Internet of Things and smart technologies) and to face global competition. In this article, as a response to the current crisis, we study the influence of Smart Working on Eco-innovation within EU 28 countries. Specifically, we evaluate the relationship between Eco-innovation index for EU 28 countries and Smart Working, by using a clustering analysis. The results show that the increased labor productivity and employees' eco-innovation are associated, to a higher extent, with the companies agreeing to a flexible and comfortable environment. These companies agree with the introduction of special programs such as working from home. We also prove that Smart Working is implemented by innovative leaders gaining economic sustainability. This study also provides several theoretical and practical contributions. We provide (i) an overview of sustainable management, including the diverse theoretical and methodological perspectives; and (ii) the recommendation of an innovation model through the bilateral collaboration for the constructs of performant sustainable strategies.

Keywords: sustainable management; strategic leaders; eco-innovation; smart working; neuroscience



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1. Introduction

In times of crisis, like the one caused by COVID-19, companies have to be very flexible to integrate smart working and to adopt a sustainable leadership to gain economic sustainability. Keeping in mind that human resources leadership is a critical aspect in reaching sustainable development, current leaders have to assign important resources (time, knowledge, technology, and finance) to smart working. Smart working [1,2] refers to distance working utilizing new smart technologies (cloud technologies, big data, and blockchain) and frontier communication technologies (5G) [3]. The smart working environment is facilitated by the multitude of smart interconnected devices, the Internet of Things (IoT) [4]. These technologies bring several advantages that have to be applied in the time of crisis. Leaders have to use these technologies to face global and fierce competition and challenges in the process of implementation of environmental management systems and

gaining value-added. As a response to these challenges, organizations have to implement sustainable leadership. Furthermore, the ecological ecosystems transform the strategic leaders: They proved to be more (i) innovative, (ii) open-minded, (iii) efficient in applying mindfulness techniques to motivate followers, and (iv) flexible and adaptive to economic and social challenges [2,5–8]. Therefore, they are referred to as innovative leaders. Prior studies focused on sustainable leadership and smart working but by now, only a few of them made a direct connection with eco-innovation [9–12].

In response to the crisis, production should be lean, minimize defects, reduce or eliminate inventories to sustain very productive and cost-efficient organizations [12–14]. Furthermore, digital infrastructure, investment in professional qualifications [10,14–16], and mindfulness of the employees is the solution to continue the activity, without health and economic negative consequences. Sustainable development is easier to achieve through smart working and an ecological living style. During COVID-19 quarantine, younger and middle-aged employees, with 4–10 years of professional experience, who have sufficient professional and smart work experience proved to be very productive [10]. In addition, during the COVID-19 period, the pollution levels decreased for air, water, soil, and noise, due to a reduction in different types of activities. River waters became cleaner, with improved visibility, and other tangible benefits to humanity and the environment [17]. Most people worked from home leading to some companies saving resources: Space rental, electricity consumption, gasoline and car maintenance, cleaning services, security protection, and waste management. The result was evident in the reduction of unnecessary service demand and improved sustainable leadership, offsetting emission footprint. These companies took friendly commitments and practices to overcome new challenges such as cost pressures, survival threats, and deprioritizing environmental sustainability initiatives [18]. In the long term, it facilitates conditions to drive service demand in a predictable and controlled way, based on sustainable mobility, sustainable supply, and production [19,20], protecting the environment, at the same time. In many industries, companies have sought to jettison well-rooted practices in the face of the existential threats stemming from COVID-19 and obtaining market competitiveness [19–21].

Smart working proved to be a method to protect the environment, to gain time and more productive employees, because they work from home comfort. Thus, smart working is associated with green innovation including materialized ecological products, processes, and green organizational practices [22]. It is due to the using of ecologic raw materials, in very small quantities, as to reduce the ecological footprint through mitigating the gas emissions and the quantity of raw materials, electricity and water. Green organizations implement eco-design principles in production and services and have good practices of waste management. Therefore, green innovation has as consequence invigorated environmental performance [23]. A green organization also experiences financial and social performance through a powerful brand: The organization protects the environment through waste and cost reduction and green innovation. Green innovations have a positive impact on peoples' health. A healthier population has high labor productivity. Smart working is an opportunity for sustained behavioral change for health, wellbeing, and lifestyle outcomes supported by whole population behavioral interventions for effective and efficient living and working. Employees have the opportunity to live happier, healthier lives in which they take a proactive role and make valued contributions to the society in which they live [24]. Smart working approach is usually implemented by strategic leaders that have a positive impact on teams' cohesion and confidence, employees' motivation, and responsibility, having as a consequence higher performance on an organizational level. Strategic leaders have a high impact on employee efficiency and stimulate employee expertise and innovation [9–11,24], while innovative leaders proved to be more innovative in ecological ecosystems.

The remainder of this paper is structured as follows. Section 2 contains theoretical background including issues of innovation systems, and sustainable leadership pillars. In the next Section 3, research process and the experimental results are shown. Section 4 includes discussion and further directions. Conclusions are presented in Section 5.

2. Theoretical Background

2.1. Innovation Systems and Sustainable Leadership

Growth in specific sectors is slowing and performant markets are difficult to forecast and are changing rapidly. The cycles of innovation and sustainable development are drastically shortened. This has a massive impact on customers: They expect individualized products and services at reasonable prices and available quickly. The quality requirements are huge, and companies have to adopt green procurement practices, to be sustainable and competitive within the circular economy context [25]. Besides, short development periods must be accomplished at very low costs. Rapid digital developments and a sustainable environment change the requirements for sustainable strategic leadership and provide excellent opportunities for future innovations to achieve the sustainable activity. In addition, Lean Start implementation has an efficient cost-profit balance, sometimes due to open-source implementations, bringing sustainability on long term [26].

Open-source projects offer many advantages in terms of their management and processing. Open-source management emphasizes the competences and integration of team members. The success of the open-source project depends completely on the degree of involvement of the team members and contributes to its development. Open-source management gives team members more independence for decision-making in their area of expertise. It is believed that each team member would make the best and fastest decision because members are much closer to problems, challenges, and options. What is revolutionary for open-source communities is how people can work together to achieve incredible results in a short period of time. Being made by a large number of co-developers, open-source software guarantees that any problems can be solved much faster than if a single person would manage the project (the principle of many eyeballs) [27,28].

COVID-19 came in turbulent times when the crisis was already about to erupt. The academia and institutions that recommended the adoption of disruptive technologies and strategic leadership anticipated the pre-disruptive plateau of the crisis (Figure 1). We may observe that the companies with a high level of strategic leadership and new technologies adoption are in the pre-disruptive upper equilibrium, while the opposite happened with the companies that did not adopt this approach. The exogenous trigger nowadays was COVID-19. Then we may see how the economy is affected and brings us in the valley of disruption [29–32].

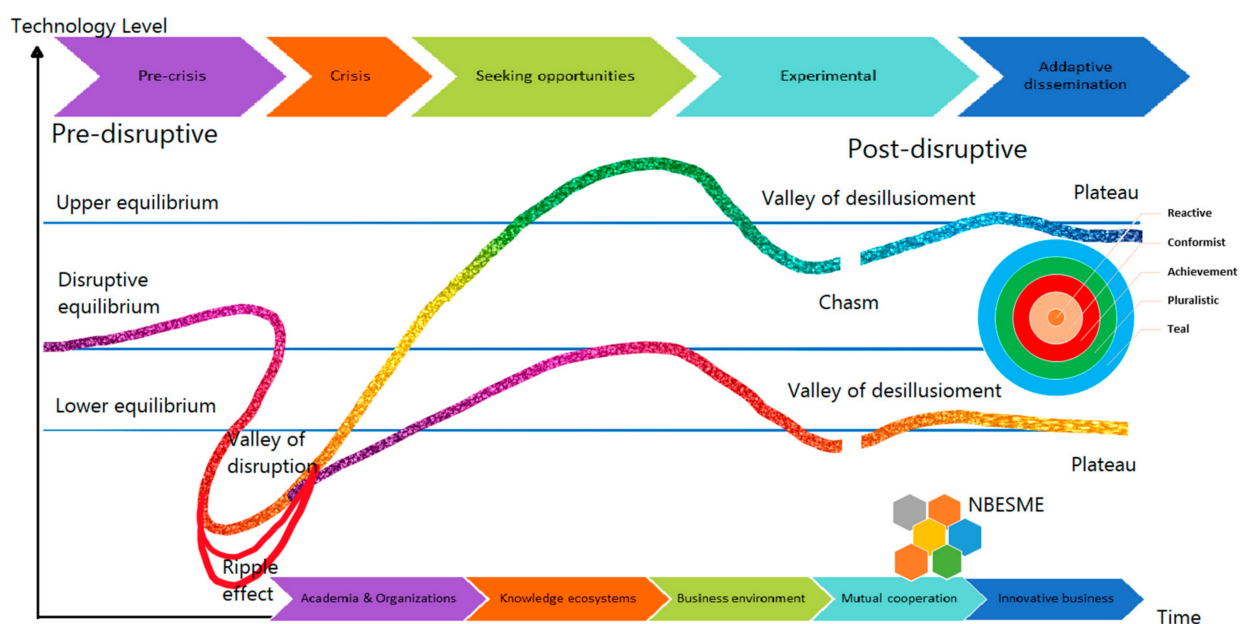


Figure 1. Crises trigger innovation systems. Source: Adaptation after Jan Spruijt (14 April 2020) [33].

The first reaction of the knowledge ecosystem was to seek opportunities and viable solutions like isolation, vaccine, smart distance working/learning, and strategic leadership for economic sustainability. The innovation ecosystem represented by the business field and laboratories tested different solutions and came with different prototypes. Some of them were not viable and caused a disillusion and here appears the chasm that has to be surpassed. We hope that soon we will surpass over the chasm of COVID-19 and that the bilateral collaboration will help us to obtain sustainable development. In the graphic, we may observe a split [32]: In the lower branch will find the reactive/impulsive organization, the conformist organization, and the achievement organizations (the red and orange circles). In the upper branch of the graph, we will find the pluralistic and teal organization that is very innovative (the green and blue circle). They spend at least 20% of the budget on innovative projects, have a long-time horizon strategy, respect the principle of circular economy and one-health, are very adaptable to market and environment, and have a strategic leadership to gain economic sustainability [30,32,33].

In Europe, 90% of firms are micro, small, and medium enterprises (MSMEs) and provide two-thirds of all private-sector jobs. Thus, the entire economy needs to support MSMEs in times of crisis, such as the one triggered by coronavirus. The epidemic caused by COVID-19 interrupted the normal activities of many MSMEs. The worse scenario is that some MSMEs will not be able to restart their activity. To cope with the new realities imposed by social distancing, the transfer of knowledge and matching, smart distance working activities might be carried out through an online cloud platform dedicated to MSMEs [30,32].

The structural economic and political crisis can be overcome with the help of governmental structures that should invest in technological infrastructure and a legal framework for innovative MSMEs. It has been found that open innovation firms collaborated with academic institutions and customers [23,33]. Some were involved in collaborative projects with their suppliers, and some collaborated with private or public R&D laboratories [14,15]. Even though universities have capabilities to offer long-distance education, one major unsolved issue is the tool/platform for knowledge and technological transfer to MSMEs. In the process of transforming a company into a sustainable organization, with the scope of gaining economic sustainability, the understanding of quality plays an important role. However, it is important to note that sustainable leadership is not implementable in all organizations, for example because of the lack of culture, lack of understanding of the context, lack of financing and information. It is also because of the other firm's structural characteristics, such as centralization, formalization, size, and complexity.

For these reasons, the strategic pillars for future changes in sustainable leadership [16,34,35] are shown below.

2.2. Sustainable Leadership Pillars

2.2.1. Personal Commitment to Quality in All Activities

This approach is a prerequisite for quality-of-life management. Quality begins with leadership at all levels. Leaders pursue quality, prioritize it, and create a culture of trust and collaboration, team working and continuous learning, and professional adaptability. Quality is the responsibility of each employee because the clients' requirements regarding products/services performance are very high. As all employees take responsibility for their actions, quality is not just a keyword, but it becomes a fundamental attitude [3,36–39].

Innovative leaders have as their main characteristic self-awareness. They know very well which are the influences and consequences of their feelings on themselves and their employees' performance. They know how to emphasize their priorities and values to develop and lead a sustainable organization. They know exactly what the target is and why it is important to achieve it. They fight passive-aggressive behavior [40–42]. An inflexible manager cannot lead a company to become innovative or to face the current and future market challenges. Thus, a new dynamic, flexible, and open-minded leader is a person that evolves day by day [43,44].

Nowadays it is not enough to know, but you must also master the method (how)-knowhow (knowledge that brings added value). The knowledge of oneself and others gives the power of ordinary people (and innovative leaders, too) to do things out of the ordinary, without waiting for traumatic crisis to decide on a major transformation. People can learn and decide to make changes in situations of crisis, suffering or they can learn and decide to make changes in comfortable, happy situations, being inspired [41,45], especially by a mindfulness leadership.

2.2.2. Quality Competence for All Staff

Individuals ensure quality. The quality itself is seen in the competence of each individual and in the willingness to cooperate and the ability to work as a team [13,36]. Innovative leaders aim to achieve superior employee performance. Thus, they are responsible for communicating as deeply as possible with employees, explaining the scientific elements within the meaning of all employees, so that they know what to expect and take on service tasks to perform it above average quality standard in the field [38,39]. Employees' tasks are clearly explained by innovative leaders [40]. The responsibility of the team leader is to make all team members understand their overall objective and look at issues holistically. Some of the leaders decide to use open-source methodology. They can focus on working and presenting strategies, and less on unnecessarily reporting each elementary step to superiors, explaining what they are going to do and what they are not going to do.

Innovative leaders have the knowledge and charisma to guide creative, self-directed, and responsible employees, having a positive impact on green product innovation performance (GPIP) [46–50]. GPIP is referred to in the literature as “the performance of a green product that is associated with ecological environment innovation, which involves pollution-prevention, energy-saving, no toxicity, waste recycling or green product designs” [49].

Innovative leaders do not motivate people with positive rewards (salary, bonuses, etc.) or negative rewards (punishment) [51–53]; however, they focus on inspirational emotional motivation, and intellectual collaborating, stimulating collective green responsibility among employees. Subsequently, innovative leaders stimulate employees' cognitive thinking and knowledge accumulation that emerge in green creativity and a high green product innovation performance [50] and induce the employees' fair play in competition, autonomy, responsibility, and creativity, followed by innovation in clean production and services, to protect the environment.

The leaders' followers (employees) have a spillover positive influence mass of companies' employees, becoming models for them, and creating a constructive context for sustainable innovation and creation of green products and services [54]. Thus, AGTL and his followers enable organizational innovation performance [55].

2.2.3. Early Testing of the Process

Rapid response to change is more important in many cases than over-planning to the last detail. This requires a culture that allows mistakes to be learned from themselves. Mistakes are understood as opportunities for improvement, employees get involved, and they can talk openly. Short development cycles require rapid and sustainable product development [36,42].

Sustainable quality leadership determines the transformation from a culture with zero defects to a new culture of error: “Fail Fast-Learn Fast”. It supports this approach through iterative tests/learning cycles and preventive quality methods [39,56]. Thus, innovative leaders are very flexible, able to adapt quickly to reach the value and the company goals.

2.2.4. Real-Time Information and Opening

Real-time information is a very important principle when it comes to make relevant quality decisions quickly and meeting long-term quality requirements. This requires relevant and refreshed data in real-time. Thus, can be created significant-quality reports for

leaders and experts to proactively control and improve processes [16,46]. The globalization and the facilities brought by IoT determine leaders solve difficult problems in the shortest time for the company sustainability [3]. They must make the decision based on the specific requirements of the company and the state of the art. Six Sigma [6] uses many tools such as Priority Matrix, Progressive Analysis, Value Analysis, Cause and Effect Diagram, Pareto Analysis, Progressive Analysis to facilitate leaders' decision through complex worksheets and panoramic panels. The volume and complexity of the data to be analyzed; the speed of response to market demands, the high quality and identity of products and services and the fierce competition.

The complex restrictions on resources, and the regulation of the circular economy are factors that have determined what leaders should base their decisions on the complex analyzes, using Business Intelligence solutions and Six Sigma methodology [29,56], which focuses on the leaders' skills: Deep thinking, creativity, and innovation. It is an art to choose the right tools for the business and to make the best decision, as to gain sustainable evolution [13,42]. Six Sigma methodology helps leaders to mitigate production defects, inefficient actions, poor quality services, etc. Consequently, Six Sigma methodology helps employees to meeting consumer demands at high expectations.

2.2.5. Prevention, Risk Management, and Systematic Improvement

This principle deals with risk management and continuous improvement. The higher the speed and complexity, the greater the risk of errors. The key to active risk management is trust and ownership. Employees can address risks openly and proactively and, where necessary, can receive support to avoid or mitigate them [16,36,37,57].

The above literature review shows that the most innovative companies that work for a sustainable economy are run by innovative leaders who are characterized by a special emotional intelligence, charisma, mindfulness, proactive attitude, and sustainable reasoning. The facilities brought by IoT and globalization determined leaders to solve difficult problems in the shortest time for the company's sustainability. They must make the decision based on the specific requirements of the company and the state of the art. This is the sustainable perspective for sustainable development from the literature review point of view.

Based on the above-mentioned arguments, we define following Propositions (P₁-P₂) that would be tested:

Proposition 1. *There is a positive relationship between smart working and the eco-innovation index.*

Proposition 2. *Flexibility at work is accepted if the labor productivity and eco-innovation index are improved.*

3. Experimental Data, Complex Analysis and Significant Results

3.1. Data and Variables

The study was carried out on EU-28 countries, regarding the eco-innovation index, labor productivity, and flexibility at work, using data from Eurostat between 2009–2018 [58]. Chosen variables are shown and described in Table 1.

Analyzing sustainable leadership above has driven us to the idea that this approach could possibly increase labor productivity, due to a very flexible and innovative attitude, activities, and methods.

Table 1. Variables description.

Variable	Description
Innov	Innov illustrates the performance across the EU Member States regarding innovation in on the economic, environmental, and social fields, analyzing five dimensions: Eco-innovation inputs, eco-innovation activities, eco-innovation outputs, resource efficiency, and socio-economic outcomes. It emphasizes the strengths and weaknesses of this filed.
Labor	Labor is expressed as GDP/ETO, where GDP = Gross domestic product, chain-linked volumes reference year, and ETO = Total employment, all industries, in persons, evaluates of national economies productivity concerning the European Union average.
Agile	Agile reflects the employed persons working from home as a percentage of the total employment, by sex, age, and professional status in EU countries.

3.2. Research Process

By now, managers have chosen solutions that bring profit to the company, without any concern about environmental damage. However, the life experience proved that we have to take into account the circular economy principles and nowadays managers have to innovate in an ecological environment. We study the impact of flexibility at work and labor productivity on the eco-innovation index while the aim of this study is defined as follows:

Definition 1. *The main aim of the study is to evaluate if there is any relation between eco-innovation and smart working.*

In the first stage of research process, we collected data from Eurostat for a period 2009–2018, and conducted a forecast for 2019–2020 [58]. It resulted in different analytical tools based on the aim of the study. The collected data was arranged in tables (containing averages for each variable) and then descriptive statistics, such frequencies, mean percentages, and histograms were used for the analysis of socio-economic variables (Figures 2 and 3, Table 2). To understand better the data collected we designed clusters and analyzed the causes of associations. The histogram for each variable and the scatterplot that studied the inference of agile leadership on innovation helped us to choose the number of clusters. Our study resulted in 5 clusters (as shown below in Table 2 and Figure 3): Cluster 1 including Nordic innovative countries; Cluster 2 including innovative countries; Cluster 3 including low productivity countries; Cluster 4 including countries with important structural and economic problems; and Cluster 5 including the countries with very high stiffness regarding flexibility.

In the second stage of research process, after correlating data, we designed a factor analysis that assumes the following: The higher labor productivity and innovation of the employees the higher probability that the company agrees a flexible and comfortable environment and program, such as working from home using IoT and 5G-smart working. The factor analysis is confirmed by the correlation between variables, factor analysis, and Cronbach's Alpha Coefficient. Please note: The value/scale of the average for variable *agile* represents the criterion for introducing the Agile values into a Groups and the countries into a certain cluster.

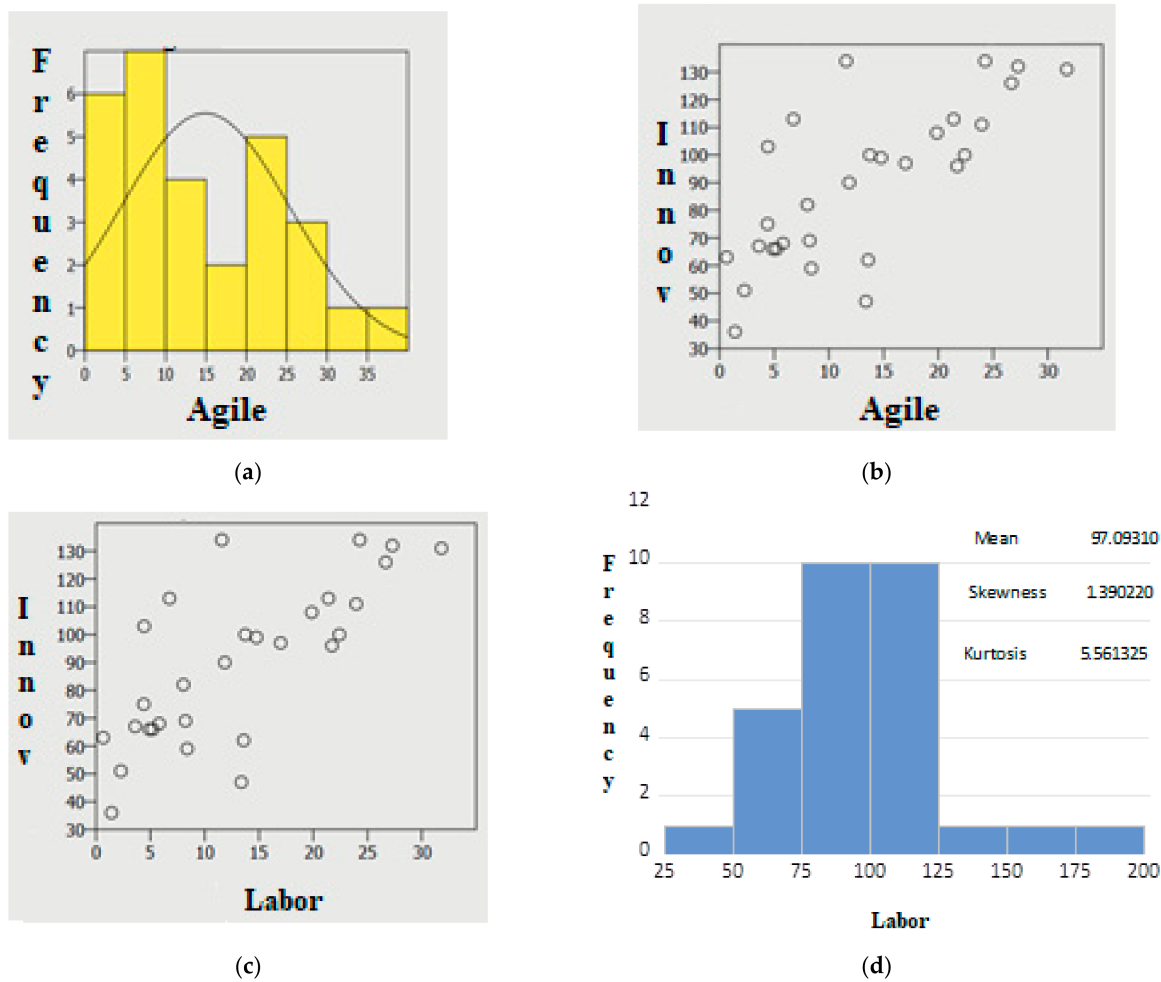


Figure 2. Descriptive statistics. Legend: (a) distribution of agile variable, (b) agile and eco-innovation variable, (c) labor and eco-innovation variable (d) distribution of labor variable.

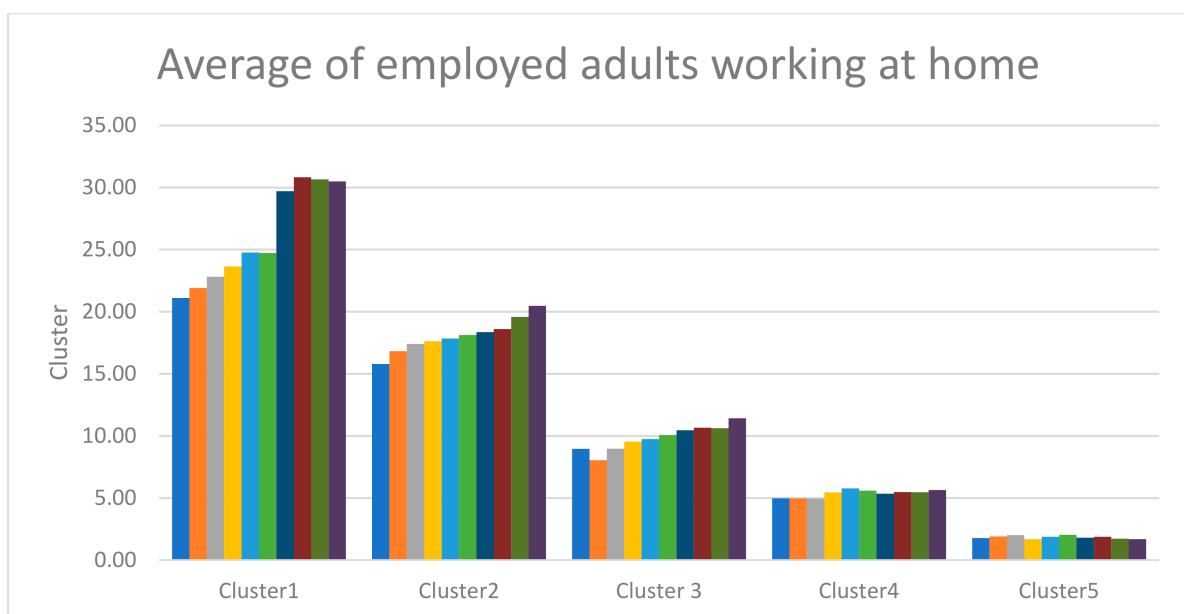


Figure 3. Eurostat data for the 2009–2018 period regarding European person working from home, category: Work-life balance (Source: Adaptation of data collected from Eurostat [58]).

Table 2. Main cluster for work–life balance.

Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
Netherlands	Belgium	Portugal	Spain	Turkey
Sweden	Austria	Poland	Croatia	Cyprus
Finland	France	Germany	Hungary	Bulgaria
Denmark	Estonia	Malta	Greece	Romania
Luxembourg	Ireland	Czechia	Italy	
UK	Slovenia	Slovakia	Latvia	
			Lithuania	

3.3. The First Stage-Cluster Analysis

First, similarly to previous studies using cluster analysis in the context of sustainability [59–61], we observed whether there is a good correlation between the 2 variables (agile and innov; Figure 2).

Skewness value (1.39) for the labor variable shows a left asymmetry (most of the values are concentrated on the left side) and very few countries have higher productivity, bigger than 97.093, the mean of the variable. The kurtosis value (5.56) for the labor variable shows a leptokurtic curve, meaning very high differences between the lowest productivity and the highest one, resulting in greater potential for extremely low or high returns. A similar interpretation we may see for the agile variable, although the variables are more dispersed.

Therefore, we designed five clusters and compared the segmentation of countries with existent taxonomy-European Innovation Scoreboard (EIS) 2020 provided by the European Commission. EIS provides a comparative assessment of the EU member states' research and innovation performance [60]. The results are as follows (see Figure 3 and Table 2):

Cluster 1: We may observe that Nordic countries (Netherlands, Sweden, Finland, Denmark, and Luxembourg, United Kingdom) have the highest percentage of people working at home (average of 26.6% people working at home in 2009–2018) and the highest labor productivity. These countries are characterized by a high innovation index reflected in sustainable development. Five out of six countries belong, according to the EIS, to the group of Innovation leaders with innovation performance high above the EU average.

Cluster 2: The second cluster of countries (Belgium, Austria, France, Estonia, Ireland, and Slovenia) represents the leader's followers with an average of 18.06% people working at home in 2009–2018 and having good labor productivity. These are countries lead by open-minded specialists looking for innovative methods to recover the gap regarding innovation and belong, except Slovenia, to the group of Strong innovators. However, in the case of Slovenia, companies' innovation (eco-innovation) were found to be determined by competitive pressures, followed by managerial environmental concern and customer demand [61]. These resource or energy efficient solutions can subsequently lead to gains in competitive advantage and have a positive influence on companies' profitability.

Cluster 3: The third cluster included Portugal, Poland, Germany, Malta, Czechia, and Slovakia with an average of 9.84% people working at home in 2009–2018. These countries have low productivity and innovation and belong to the group of Moderate Innovators according to EIS. There are two interesting exceptions including two countries representing Strong innovators. The first is Germany that has a very high innovation index. It seems that other factors help innovation in Germany, such as a very high GDP, political influence, very strict rules regarding research, quality of production, adoption of high technologies, etc. Portugal is the second exception. However, in previous years, Portugal also belonged to the Moderate innovators group. Many Portuguese firms are still closed to internal resources and might miss several opportunities [62]. Other firms miss

early collective entrepreneurial culture, have difficulties obtaining finance and are risk averse.

Cluster 4: The fourth cluster (Spain, Croatia, Hungary, Greece, Italy, Latvia, and Lithuania) has an average of 5.36% of people working from home in 2009–2018. The countries in this cluster represent Moderate Innovators and have important structural and economic problems and their flexibility regarding work balance life has a small impact on innovation. This could be also because this cluster includes number of Central and Eastern Europe countries that faced historically problems such as low trust connected with mental lock-in and difficulties in sharing information, lack of funds and insufficient incentives to cooperate, less developed social capital [63]. Especially in comparison with the countries of Northern and Western Europe.

Cluster 5: The fifth cluster (Turkey, Cyprus, Bulgaria, Romania) has an average of 1.83% of people working from home in 2009–2018. Here is included Romania (0.65%), with a very high stiffness regarding flexibility and adaptation to current challenges and with a very low index of innovation and low productivity. On the one hand, two out of four identified countries belong to the group of Modest innovators with the lowest innovation performance, in comparison with other EU Members States. On the other hand, surprisingly, Cyprus also belongs to this cluster. Cypriot companies also face a number of challenges that may hinder their ability to innovate and increase productivity [64]. For example, they show that firms highly investing in R&D are biased against ideas generated from national partners and that focus on openness (R&D and national) may lead to a diversion of managerial attention.

The difference between the average of agile variable for the 5 clusters are: C1-C2 = 8, C2-C3 = 8.22 (almost 8), C3-C4 = 4.48 (almost 4), and C4-C5= 3.53 (almost 4). The spread of countries in clusters were done by software. The main criterion was the homogeneity within groups of cases. Each group contains countries that have the average of Agile variable very close to each other like in “k-nearest neighbors” algorithm. The distances of each data point (average of agile for a country) to the centroids are almost equal.

Our analysis emphasizes that the flexibility at work is accepted if the labor productivity and eco-innovation index are better/improved for sustainable development.

3.4. The Second Stage-Factor Analysis

Second, we conducted Factor analysis, consistent with previous studies using Factor analysis in the cases of sustainability issues [65,66]. The analysis is reliable and representative. The Cronbach’s Alpha Coefficient sustains this affirmation. This coefficient measures reliability, or internal consistency-how well our analysis measures the relationship between analyzed variables. Because Cronbach’s Alpha is higher than 0.7 (0.73 in our case) we have to accept the internal consistency and reliability of the model (Table 3).

The Factor Analysis is appropriate when analyzing 1 dependent variable (*agile* variable) and 2 or more independent interval or normal variable with 2 or more levels, independent groups, (labor and innov variable. The Factor Analysis and Correlation Analysis confirm that there is a very high and positive correlation between all variables: Meaning, if *agile* (smart-working) variable increases the labor (productivity) variable increases by 99%, too and if agile (smart-working) variable increases the innov variable increases in 75%, too. The Eigenvalues show a greater influence of labor on the dependent variable than innov (eco-innovation) influence (Table 4).

Table 3. Reliability of the model.

Case Processing Summary				
		N	%	
cases	Valid	29	96.67	
	Excluded	1	3.33	
	Total	0	100.00	
Reliability Statistics				
Cronbach's Alpha			N of Items	
0.73			3	
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Correlated Item-Total Correlation	Cronbach's Alpha if Item Deleted
agile	102.67	1265.77	0.85	0.60
labor	102.67	1265.42	0.85	0.60
innov	26.16	317.08	0.75	1.00

Table 4. Factor analysis. Total variance explained.

Factor	Initial Eigenvalues			Extraction Sum of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	824.68	96.27	96.27	365.56	18278.04	18278.04
2	31.95	3.73	100.00			
Factor Matrix						
		Labor			1	
		Innov			13.65	
					13.39	
			Agile		Labor	Innov
			1			
			0.999999		1	
			0.74653		0.746493	1

Following above results, we can confirm our propositions stated above.

4. Discussions and Further Recommendations

In our study, we improved the model proposed by Spruijt, explaining how the crisis can be faced through bilateral collaboration innovation within an ecosystem (Figure 1). An environment dedicated to innovation within a Network of a Business Ecosystem (NBE) supports the bilateral collaboration. Companies, especially MSMEs, should cooperate into an ecosystem (NBESMEs–Figure 1). Within the network, a governmental institution through specific policy on intellectual property must smooth the communication between entities.

In this regard, we propose a model for the whole life cycle of a product/service (awareness, training; analysis; product (re)design; communication/ certification) and supply chain might be as the one described below [67,68]:

- Multinationals organizations or state institutions has the role of providing the infrastructure for open innovation inventions and licenses;
- innovative SMEs become members of the network and brings new ideas of innovations (products, services, methodologies, technologies);
- an ecological agency will test the innovation regarding fulfilling circular economy principles;
- if the idea is sustainable and green, then a marketing agency will test the market challenges;

- having in mind the market feed-back, the company tests the feasibility of the idea with a consultant agency;
- for a feasible idea is the inventors and academic researchers within the ecosystem suggest different solutions to be applied. A focus group will choose the best solution and will implement the idea within the ecosystem, receiving financing from multinationals organizations or state institutions;
- the marketing agency, that had tested the market in the anterior step will have the role to sell the product/service; and
- a supervisor, the governmental partner, takes care that the profit is shared, and the patent is protected.

The ecosystem offers an ICT platform and online services that are the support of business for the entire product/service life cycle. The members of the ecosystem come from different fields: Research, marketing, ecology, consultancy, government, inventors, and different size companies.

The infrastructure has to answer to strategic leadership problems, using chatbots, machine learning algorithms, and A.I. Thus, managers are unable to make grounded and fair decisions without a high degree of accuracy of the information. Here, comes the role of the platform. The platform will organize training courses for the human component: Taking into account the degree of economic and technical culture, the user acceptance degree of new technologies, and their capacity for analysis and synthesis. The platform might organize training courses. The platform might contain [68]:

- Announcements and descriptions of project competitions in which MSMEs may participate;
- important official regulations on MSMEs; and
- best practice presentations of MSMEs from the EU.

MSMEs may face the crisis if they innovate as in the proposed model in a Network Business Environment (NBE) implementing the principles of Blue Ocean Strategy (ERRC). The results will be:

- ZEliminating the factors for which competition was intensive for a long time. In the virtual business environment network, for MSMEs competing, these barriers no longer exist. The network facilitates open trusted communication, offering access to knowledge;
- reduce well below standard limits some factors with negative influence for SMEs, such as macroeconomic instability, problems associated with credit, and production costs;
- raise the factors that should be augmented, well above the standard limits, such as the portfolio of services, performance network, international coverage, and key competitive success factors; and
- create inexperienced activities until now, such as innovation, new jobs, and new methods of training, using A.I.-chatbots to answer in real-time, and solve problems.

In this pandemic crisis, strong policy response prevents structural problems, and the government should ensure the management of essential supply chains in partnership with the private sector, such as [69]:

- Protecting the employees, as a top priority, because they manifest value-added, creativity, and innovation;
- setting up a cross-functional response team: Employees from every function and discipline should be led by an agile manager;
- ensuring sufficient liquidity for at least 3 months of cash at hand;
- stabilizing the supply chain-Business Continuity Management has to be achieved through long-term actions (e.g., supplier regional diversification);
- practicing Customer-centric Design (CCD)-in staying close and engaging customers, companies should ensure customer transparency and agile responses; and

- helping community-in times of pandemic crisis that affects the community, it is important and morally responsible for organizations to take an active role in helping the community at large.

5. Conclusions

Nowadays, companies driven by innovative leaders are innovative and fulfil the principles of circular economy and one-health, are very adaptable to market and environment. There is no doubt that sustainable management is an appropriate approach to meet the crisis challenges (for example, as the one caused by COVID-19 pandemic) and is adopted by teal and pluralistic companies. For example, in the most innovative Romanian companies, this phenomenon is real, and therefore, we decided to study if this phenomenon is presented also within EU-28 countries.

Prior research showed that companies that have implemented sustainable leadership replaced the formal, hierarchical organizational structures with a dynamic team structure. Competence leadership also plays an essential role. Teams work on their responsibility, support open communication, and are highly integrated into the global network. The requirements of the process are understood as framework conditions that can be easily and flexibly adapted to the respective needs. Mistakes are understood as an opportunity to learn quickly and improve things. The innovation systems, formed by knowledge ecosystems, business ecosystems, and bilateral collaboration have four major characteristics: Structure, HR, work environment, and major organizational process.

In our study, we improved the model proposed by Spruijt, explaining how the crisis can be faced through bilateral collaboration innovation within an ecosystem. An environment dedicated to innovation within a Network of a Business Ecosystem (NBE) supports the bilateral collaboration. Companies, especially MSMEs, should cooperate into an ecosystem (NBESME). Within the network, a governmental institution through specific policy on intellectual property must smooth the communication between entities.

In this regard, we proposed a model for the whole life cycle of a product/service (awareness, training; analysis; product (re)design; communication/certification). We concluded that smart working and the ecosystem offers an ICT platform and online services that are the support of business for the entire product/service life cycle. The members of the ecosystem come from different fields: Research, marketing, ecology, consultancy, government, inventors, and different size companies. MSMEs may face the crisis if they innovate as in the proposed model in a Network Business Environment (NBE) implementing the principles of Blue Ocean Strategy (ERRC). Moreover, in time of crisis, strong policy response prevents structural problems, and the government should ensure the management of essential supply chains in partnership with the private sector.

The main limitation of this study is that we made interpretation on very general data providing information about 29 countries. Therefore, there is a lower opportunity to propose more country-specific recommendations. Moreover, the forecast was done for 2019–2020 because no data were available and was included in Factor Analysis. On the other hand, our study provides impetus for further research in this area, including consideration and analysis of other variables as well as considering introducing a timeline and a structural break into analyses. For these reasons, our further research will contain a survey with manager's opinions regarding smart working, its efficiency and barriers encountered in implementing a sustainable green transformational leadership. Another possible limitation of this study is that the empirical evidence is country level. Therefore, future research should also focus on firm level issues.

This study also comes up with questions that may stimulate further research into the relationship between work from home and innovation. In addition, it evokes questions about the approach of public policy makers to these issues. As we showed above, Cluster 1 included countries with the highest percentage of people working at home. These countries also belong to the group of Innovation leaders according to the EIS. However, there are growing questions (i) on the conduct of science and discovery; and (ii) how innovation

infrastructure (for example labs, buildings, and social ecosystems) might change because the majority of this infrastructure cannot yet be virtualized [70]. There is also a question of what role public authorities play in this case and to what extent they should intervene in these processes. The creation of a favorable pro-innovative environment seems to be crucial. Social capital formation among employees is also crucial today because people working from home cannot meet their co-workers. This results in lower building of trust between cooperating entities and in limited emergence and spread of knowledge spillovers. In the future research, therefore, it is also necessary to measure the effectiveness of the use of online platforms such as MS Teams and Zoom in processes of innovation creation.

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