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Cultural Values as Catalysts of Technological Innovation for a Sustainable Future

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Abstract: Innovation is a key element for companies that aim to achieve and sustain a competitive advantage. Recently, a great number of academics and practitioners have focused on the role of cultural values to provide further incentives to firms to invest more in innovation that will give them a market edge. The purpose of this paper is to provide further insights into the relationship between cultural values and innovation. Primary data were collected from top managers in medium- and large-sized enterprises to determine how cultural values affect four types of technological innovation. The results indicate that two cultural values have a significant influence on firms' innovative practices. Collectivism and uncertainty avoidance have a significant negative impact on radical, process and product innovation. Thus, we argue that managers who emphasize their personal ambitions and are comfortable with ambiguity are more likely to achieve innovation in their organization.

Keywords: technological innovation; cultural values; sustainable growth; innovation efficiency; societal values

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1. Introduction

Innovation is a critical factor for companies that aim to achieve and sustain a competitive advantage [1,2]. Drucker [3] in his seminal paper highlighted the importance of innovation in the challenging and complicated business environment. According to Subramaniam and Youndt [4], the two main classifications of innovation are incremental and radical. It is argued that companies with better innovative capabilities can achieve higher levels of profitability, whereas such a process may lead to a country's economic development. Therefore, it is of paramount importance to understand the determinants of a firm's innovative ability (see for example Boubakri [5], Chen et al. [6] and Jourda and Smith [7]. This issue has attracted substantial attention among academics and practitioners over time, while in reference to managerial incentives and skills, corporate governance, and firm competitiveness and size are considered the main determinants of innovation. Thus, Hirshleifer et al. [8], Chang et al. [9], Chen et al. [10] and Cho et al. [11] among others provide significant evidence that higher levels of innovation are linked to managerial contracts that lead to higher rewards based on long-term success as opposed to short-term benefits of the shareholders, while Agoraki et al. [12] examine the types of innovation that influence sustainable development. Innovation can serve as a key driver of sustainable development, providing the appropriate technologies and approaches needed to address complex challenges and create a more sustainable future. Ferlito and Faraci [13] and Oliveira-Dias et al. [14] consider business model innovation a key factor for competitive advantage and corporate sustainability. On the same strand, Yang et al. [15] argue that innovation can lead to sustainability. Previous research also shows that higher levels of innovation are associated with CEO overconfidence and managerial ability, among others.

In a nutshell, according to alternative theories of entrepreneurial entry [16–18], it is argued that the issue of an individual's engagement in entrepreneurial activities depends not only on the individual's abilities and skills but also on the cultural values dominating in the society. Cultural values are the core element of culture, while the outer layers consist of the rituals, heroes and symbols shared by a social group [19]. Moreover, as Newberry et al. [20] underline, social culture could shape entrepreneurial identity, which is a crucial element for a future career in the field. Overall, three main directions have been formulated in the relevant literature on the relationship between cultural values, entrepreneurship and innovation. The first direction through which cultural values influence the individual's willingness to engage in entrepreneurial activities refers to a "pull" perspective of the cultural impact on entrepreneurship and innovation. This channel of reasoning highlights the importance of psychological factors on entrepreneurship motives [21]. Etzioni [22] and Fayole et al. [23] bring to the surface a second direction of entrepreneurship motivation. They argue that in societies with a culture that is supportive of entrepreneurship and innovation, we should expect that individuals are more willing to follow the path to become an entrepreneur. Finally, the third direction, namely, the dissatisfaction approach, looks at the issue from a "push" perspective, highlighting that the driving force for entrepreneurship entry is the difference between those individuals that are willing to become entrepreneurs and the rest of the population.

Incentives to promote innovation at the country and firm level require a strong national and organizational culture that encourages risk taking and a high degree of tolerance for failure in the short run to receive the rewards in the long run [24]. Cultural values are also considered important elements for business outcomes, given that companies are an integrated part of society since firms are interrelated with local customers, suppliers and employees. Therefore, as Bloom et al. [25] argue, cultural norms have a significant effect on the values and the firm's economic and social behavior. In his seminal work, Porter [1] underlines that firms must innovate to enhance their competitive advantage and survive in an increasingly globalized environment, while Pistikou et al. [26] show in a recent study the importance of innovation for S&P500 companies. Cultural values reflect characteristics which are inherited in the population that take many decades to change, implying a lasting trace on the practice of entrepreneurship at the national level [27]. Shane [28] underlines that countries need to promote those cultural values that encourage innovation while stating that investing in research and development is a required but not sufficient condition for improvements in innovation performance. On the same strand, Deirmentzoglou et al. [29,30] investigate the influence of culture on sustainable development.

Sufficient empirical evidence suggests that cultural values significantly affect the rates and types of national entrepreneurial activity [16,31]. The empirical evidence is further strengthened by surveys that show that an entrepreneurial career finds its roots in young people. Bergman et al. [32] suggest that the increase in university education influences entrepreneurship and innovation significantly as it contributes to knowledge transfer from university classrooms and research laboratories to the markets.

Van Everdingen and Waarts [33], Taylor and Wilson [34] and Khan and Cox [35] are among several studies that document that cultural values critically affect innovation levels. However, as Kaasa [36] argues, this potential influence between cultural values and innovation can lead to either a positive or negative environment for innovation. Kroenke et al. [37] underline the impact of cultural values such as power distance, individualism, long-term orientation and indulgence on the performance of innovation and thus on the economic structure of the economy. Francisceto and Neiva [38] also provide evidence in support of the positive impact of cultural values on innovation levels.

Furthermore, Bukowski and Rudnicki [39] consider the nexus between the dimensions of cultural values, innovation and creativity. They argue, using data for a group of East Asian countries, that individualism does not justify the role of culture ad hoc. Instead, they find strong evidence for the positive impact that long-term orientation and flexibility have on innovation. In a similar vein, Gallego-Alvarez and Pucheta-Marinez [40] investigated

the link between cultural values and investment in R&D. The main finding of their analysis is that the dimensions of masculinity, power distance, low uncertainty avoidance and long-term orientation are the important characteristics which will lead companies to invest in R&D, whereas individualism is not a statistically significant driver of a firm's investment decisions to increase spending on innovative incentives. Bogatyreva et al. [41] investigate the relationship between cultural values and innovation and entrepreneurship, and they conclude that a group of national cultural dimensions has an impact on entrepreneurship and innovation.

Innovation is a key element for a firm's product differentiation and competitiveness. The recent arguments of academics and practitioners indicate that the role of cultural values provides further incentives to firms to invest more in innovation and in R&D that will give them a market dynamic edge. The present paper aims to provide further insights into the relationship between cultural values and innovation, as cultural values shape the perception and integration of technological advances, influencing both the direction and shape of innovation. Our study contributes through the in-depth investigation of the entrepreneurial intention–behavior relationship to ensure that technological innovations are aligned with sustainable values which are able to promote viability for current and future generations. The way in which cultural values envision a sustainable future can shape innovation pathways and encourage technological development that prioritizes sustainability considerations.

2. Literature Review

Hofstede [42] argues that certain values which are transmitted from generation to generation within a society provide the framework for the formation of specific attitudes, motivation and behavioral patterns that frame the so-called mental programming: culture. In his seminal work, Hofstede [19,42] proposes six cultural values: (a) power distance—the level at which a person approves of hierarchy, even when there is no adequate justification; (b) uncertainty avoidance—the level at which a person experiences uncertainty as uncomfortable; (c) individualism vs. collectivism—the level at which a person feels part of a group; (d) masculinity vs. femininity—the level at which the use of power is socially approved; (e) long-term vs. short-term orientation—the level at which a person focuses on the future or the present; and (f) indulgence vs. constraint—the degree to which a person feels free to express themself.

Shane [28] provides one of the earlier research works on the investigation of a possible relationship between national culture and innovation. He analyzes a sample of 33 countries for the period from 1975 to 1980 and concludes that the rates of innovation (proxied as the per capita number of trademarks) are mainly associated with uncertainty avoidance as well as power distance and individualism.

Boubakri et al. [5] examine whether and how cultural values have an impact on corporate innovation. They employ a comprehensive database on innovation for a large sample of countries that covers a long period of time to capture the entry of new innovators, changes in business cycles and other effects that might appear in the long run. They control the impacts of formal institutions, and firm-level and country-level variables, as well as for cultural zones. They find strong evidence that cultural values have a significant influence on innovation. Specifically, their analysis shows that it is more likely that a firm will undertake more investment on innovation in societies that are individualistic, indulgent and long-term oriented, as well as in cultures with less power distance, less uncertainty avoidance and less masculinity. Furthermore, Boubakri et al. [5] argue that the baseline results are maintained when they only consider the subsample of innovative firms, namely, that there is a significant impact of culture on firms' innovation performance/quality. Their analysis also deals with the issue of the potential endogeneity of culture. Although reverse causality is unlikely to run from innovation to culture, Guiso et al. [43] argue that values, beliefs and preferences exhibit long memory and therefore are very slow to change. Using a 2SLS-IV econometric approach with appropriate instruments as well as the GMM approach,

the reverse causality hypothesis is rejected, and therefore, the baseline results are shown to exhibit robustness. Boubakri et al. [5] argue that the results of their analysis have important implications for both managers and policy makers. Thus, the strong evidence that there is a statistically significant positive relationship between cultural values and innovation directly implies that investment in research and development by firms, although it is a requirement, is not a sufficient condition to promote innovation and entrepreneurship. Therefore, government policies and programs need to be designed to boost innovative behavior in the long run.

Espig et al. [44] examine the relationships between different cultural values and innovation. They employ innovation data by country to unveil those characteristics of national cultural dimensions that contribute to firms' decision making to increase investment in innovation. They conduct their analysis using the Hofstede's national culture database, as well as the innovation index from the GII database, while the population data are retrieved from the World Bank database for the period 2015–2018. Espig et al. [44] confirm that cultural values influence innovation rates positively. Moreover, they find that innovation levels are expected to be higher in societies where one observes a low distance from power, high individualism, femininity characteristics, low aversion to uncertainty, long-term orientation and a higher level of indulgence. Bogatyreva et al. [41] focus on the link between intention and translation to entrepreneurial behavior. Based on this stylized fact, Bogatyreva et al. [41] employ data from two groups of the multi-country Global University Enterpreneurial Spirit Students' survey conducted in 2011 and 2013/2014. Their main finding is that national culture influences the link between entrepreneurial intention and subsequent action.

Chen et al. [6] also examine the mechanism through which cultural norms influence corporate innovation. The researchers show that firms located in societies in which we observe higher levels of the uncertainty avoidance dimension are expected to produce a lower number of patents, usually of lower importance, leading to the conclusion that in this case, firms are less efficient with their R&D expenditure. The main finding of their study is that cultural values have a significant impact on firms' decisions to increase innovation in a global context. Furthermore, Chen et al. [6] show that the differences in national culture are an equally important factor to boost investment in innovation among Asian and non-Asian countries.

Strychalska-Rudzewicz [45] also examines the nexus between cultural values and the level of innovation using data for a large group of developed and emerging countries. In principle, it is shown that cultural factors play an important role in creating innovation. Strychalska-Rudzewicz [45] explains that the hypothesis formulated by Shane [28] that the dimensions of low power distance and strong individualism have a substantial influence on the level of innovation, despite such a causal relationship, does not seem to hold for Far East Asian countries. Such weak evidence in the case of Far East Asian countries may be attributed to cultural differences with the rest of the countries in the sample. In addition, it is shown that the dimensions of low power distance and low uncertainty avoidance are most likely to increase the levels of innovation in European countries. Finally, the results for the dimension of individualism vis-à-vis collectivism are not clear-cut, but still, those European countries that are more individualistic achieve better innovation levels. In a related study, Lee et al. [46] analyze the influence of the Hofstede cultural dimensions on the Global Innovation Index scores during the pre- and post-crisis years of the 2007–2009 financial crisis and the 2019–2021 COVID-19 pandemic. The main finding shows that the same cultural characteristics are the driving force for increasing the level of innovation either before or after each of the two crises under consideration. By contrast, Lee et al. [46] argue that an important factor for innovation performance is the income group that has a significant impact on the relationship between cultural characteristics and innovation.

Papula et al. [47] examine the impact of cultural values on innovation activities. Their analysis is conducted with two cultures from the European region. The first group of

countries under investigation consists of Germany, Austria and Switzerland, whereas the second group is represented by the Czech Republic. Their analysis is undertaken with the employment of a large-scale questionnaire survey in 2015–2018. The main findings of their analysis imply that cultural aspects in the examined groups have a strong impact on innovation, and this finding is robust across both groups. Jourdan and Smith [7] also examine the causal relationship between cultural values and the levels of innovation. They investigate this relationship by looking at the link between countries' innovation, entrepreneurship and creativity, and the six cultural values. Specifically, Jourdan and Smith [7] suggest four measures that are associated with economic development and innovation, whereas the factor structure of Hofstede's six cultural dimensions were reduced to these major factors, namely, heteronomy–autonomy, gratification, and competition–altruism. The main finding of the regression analysis shows that heteronomy–autonomy and gratification predict the Global Innovation Index, whereas gratification predicts the other three measures of economic development and innovation, namely, the Global Entrepreneurship Index, the Global Creativity Index and the Bloomberg 50 most innovative countries (B50), confirming the positive relationship between culture and levels of innovation. Murswieck et al. [48], using a sample of 28 European countries, find that the cultural dimension of indulgence leads to an improvement in the levels of innovation, as proxied by the European Innovation Scoreboard. Their analysis is based on global country-level data with respect to innovation and country-level control variables.

3. Research Hypotheses

3.1. Power Distance

Power distance (PDI) is the level at which a person approves of hierarchy, even when there is no adequate justification. Scientists accept that there are fewer hierarchical constraints in cultures with lower power distance, resulting in advantages of exhibiting and expressing novel ideas compared to cultures with high levels of power distance [49]. Moreover, individuals in low power distance cultures tend to consider having sufficient opportunities to innovate [50]. Previous studies show that the lower the power distance, the higher the innovation performance [44]. Thus, power distance is expected to have a significant negative impact on innovation:

H1a. *Power distance (PDI) has a significant negative impact on incremental innovation.*

H1b. *Power distance (PDI) has a significant negative impact on radical innovation.*

H1c. *Power distance (PDI) has a significant negative impact on product innovation.*

H1d. *Power distance (PDI) has a significant negative impact on process innovation.*

3.2. Collectivism vs. Individualism

Collectivism vs. individualism is the level at which a person feels part of a group. Individuals with high levels of collectivism are more likely to care about others, while individuals with high levels of individualism care most about themselves. Tian et al. [51], who conducted a systematic literature review on culture and innovation, argue that collectivism and individualism have a significant impact on innovation performance, although the results are mixed. For instance, Kaasa and Vadi [52] find a positive effect of one type of collectivism, family-related collectivism, on innovation. However, most studies have found that high levels of individualism have a positive association with innovation. Desmarchelier and Fang [53] reveal a positive effect of individualism on innovation diffusion patterns, while Griffith and Rubera [54] show a positive influence of individualism on design innovations among 17 European organizations. As proposed, individualistic people

are more likely to act on their own to develop creative ideas [55] and drive innovation, and thus, collectivism is expected to have a significant negative impact on innovation:

H2a. *Collectivism (COL) has a significant negative impact on incremental innovation.*

H2b. *Collectivism (COL) has a significant negative impact on radical innovation.*

H2c. *Collectivism (COL) has a significant negative impact on product innovation.*

H2d. *Collectivism (COL) has a significant negative impact on process innovation.*

3.3. Masculinity vs. Femininity

Masculinity vs. femininity is the degree to which the use of power is socially approved. Individuals in masculine societies tend to be more aggressive and assertive, while those in feminine societies tend to value quality of life. Efrat [56] reveals mixed results regarding the relationship between masculinity and the motivation to innovate. In particular, the scholar finds that masculinity has a significant positive impact on the generation of patents and a significant negative impact on the development of scientific articles. In their study, Kaasa and Vadi [52] reveal that femininity has a positive influence on innovation. Thus, individuals with low levels of masculinity tend to work in a more collaborative and trustful climate that encourages the exchange and implementation of new ideas which may result in innovation. Based on the above, masculinity is expected to have a significant negative impact on innovation:

H3a. *Masculinity (MAS) has a significant negative impact on incremental innovation.*

H3b. *Masculinity (MAS) has a significant negative impact on radical innovation.*

H3c. *Masculinity (MAS) has a significant negative impact on product innovation.*

H3d. *Masculinity (MAS) has a significant negative impact on process innovation.*

3.4. Uncertainty Avoidance

Uncertainty avoidance is the level at which a person experiences uncertainty as uncomfortable. Individuals with high levels of uncertainty are more likely to be attached to formal rules and bureaucracy that ultimately set constraints on innovative initiatives. Shane [28] examines the influence of cultural values on national rates of innovation and reveals that high innovation levels are associated with low uncertainty avoidance levels. Moreover, Efrat [56] finds that countries with low uncertainty avoidance have high levels of innovation. In the same strain, Griffith and Rubera [54] indicate that uncertainty avoidance has a positive impact on technological innovations in enterprises; Chen et al. [6] find a positive association of this value with the generation of patents, while Gallego-Alvarez and Pucheta Martinez [40] show a positive impact of this value on business innovation practices. Thus, uncertainty avoidance is expected to have a significant negative effect on innovation.

H4a. *Uncertainty avoidance (UAI) has a significant negative impact on incremental innovation.*

H4b. *Uncertainty avoidance (UAI) has a significant negative impact on radical innovation.*

H4c. *Uncertainty avoidance (UAI) has a significant negative impact on product innovation.*

H4d. *Uncertainty avoidance (UAI) has a significant negative impact on process innovation.*

3.5. Long-Term vs. Short-Term Orientation

Long-term vs. short-term orientation is the level at which a person focuses on the future or the present. Individuals with a high level of long-term orientation are more likely to take action and invest in their future. Long-term orientation favors innovation as it demands long-term planning and commitment. Van Everdingen and Waarts [33] find that long-term orientation is associated with high rates of adoption of innovation by medium-sized European organizations. Moreover, Prim et al. [57], who examine the Global Innovation Index, reveal that long-term orientation is positively associated with innovation outputs. Based on the above, long-term orientation is expected to have a significant positive impact on innovation.

H5a. *Long-term orientation (LTO) has a significant positive impact on incremental innovation.*

H5b. *Long-term orientation (LTO) has a significant positive impact on radical innovation.*

H5c. Long-term orientation (LTO) has a significant positive impact on product innovation.

H5d. *Long-term orientation (LTO) has a significant positive impact on process innovation.*

3.6. Indulgence vs. Restraint

Indulgence vs. restraint is the level at which a person feels free to do what they want. As this is the newest cultural value included in Hofstede's framework, limited research has considered this value. Prim et al. [57] find that indulgence has a positive association with the Global Innovation Index, whereas in a recent study, Rubino et al. [58] reveal a positive relationship between indulgence and a firm's digitalization. Individuals with high levels of indulgence are more likely to feel free to express their creativity and engage in initiatives involving innovation. Thus, indulgence is expected to have a significant positive impact on innovation (Figure 1).

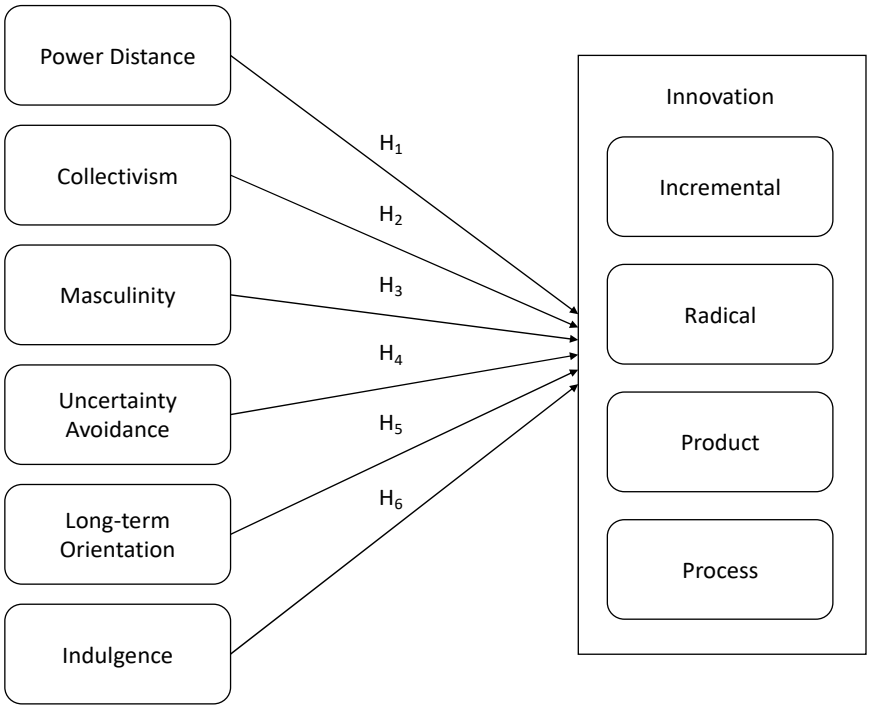

Figure 1. Conceptual framework.

H6a. *Indulgence (IDL) has a significant positive impact on incremental innovation.*

H6b. *Indulgence (IDL) has a significant positive impact on radical innovation.*

H6c. *Indulgence (IDL) has a significant positive impact on product innovation.*

H6d. *Indulgence (IDL) has a significant positive impact on process innovation.*

4. Methodology

As business executives lead the innovation process of the organization [59,60], top managers were considered the appropriate population for this study. The questionnaire was addressed to Chief Executive Officers (CEOs) in Greek medium- and large-sized enterprises, as these enterprises are more innovative [58]. In addition, Greece was chosen as it is the country with the highest percentage of reported innovative enterprises in the EU for 2018–2020 [61] and has also improved its innovation capacity by about 25% between 2014 and 2021 [62]. Of the total number of questionnaires sent out, 1145 were received by the CEOs and 171 (14.9%) were answered. However, 142 were considered suitable for analysis as 29 questionnaires were not properly completed.

A questionnaire was developed to measure innovation and cultural values. In this research, innovation was measured by two dimensions on a five-point Likert scale. The first dimension was incremental (INC) and radical (RAD) innovation, which was assessed based on Subramaniam and Youndt's [4] questionnaire, while the second dimension was product (PRD) and process (PRC) innovation, which was assessed with questions based on Prajogo and Sohal's [63] instrument. In addition, cultural values were measured on a seven-point Likert scale with questions adapted from Vitell et al. [64] and Hofstede's [65] instrument (Appendix A). Finally, organizational size (SIZE), CEO education level (EDU), age (AGE) and gender (GND) were measured as control variables.

5. Analysis and Results

Among the 142 CEOs who participated in the survey, 119 (84%) were male and 23 (16%) were female. In terms of age, 12 (8.5%) were 25–34 years old, 30 (21%) were 35–44 years old, 34 (24%) were 45–54 years old, 43 (30%) were 55–64 years old, while the remaining 22 (16.5%) were over 65 years old. Furthermore, among the respondents, 8 (6%) had a high school diploma, 61 (43%) had a bachelor's degree, 67 (47%) had a master's degree, while 6 (4%) had a doctorate. Finally, 84 (59%) CEOs managed a medium-sized company, while the remaining 58 (41%) managed a large company.

To assess the validity, reliability and internal consistency of each construct, average variance extracted (AVE), composite reliability (CR) and Cronbach's alpha (α) were calculated. The calculated values are within the acceptable range and the results are presented in Table 1.

Table 1. Factor loadings, composite reliability, AVE and Cronbach's alpha.

Variables	Items	LF	CR	AVE	A
PDI	PDI1	0.84	0.80	0.58	0.64
	PDI2	0.82			
	PDI3	0.61			
COL	COL1	0.78	0.85	0.66	0.73
	COL2	0.83			
	COL3	0.82			
UAI	UAI1	0.79	0.85	0.65	0.73
	UAI2	0.81			
	UAI3	0.82			

Table 1. *Cont.*

Variables	Items	LF	CR	AVE	A
MAS	MAS1	0.72	0.81	0.58	0.64
	MAS2	0.8			
	MAS3	0.77			
LTO	LTO1	0.68	0.85	0.59	0.76
	LTO2	0.79			
	LTO3	0.82			
	LTO4	0.77			
IDL	IDL1	0.79	0.83	0.56	0.74
	IDL2	0.75			
	IDL3	0.72			
	IDL4	0.72			
INC	INC1	0.86	0.85	0.66	0.73
	INC2	0.81			
	INC3	0.76			
RAD	RAD1	0.85	0.91	0.77	0.85
	RAD2	0.9			
	RAD3	0.88			
PRD	PRD1	0.82	0.91	0.66	0.87
	PRD2	0.73			
	PRD3	0.79			
	PRD4	0.89			
	PRD5	0.83			
PRC	PRC1	0.81	0.92	0.70	0.89
	PRC2	0.83			
	PRC3	0.89			
	PRC4	0.8			
	PRC5	0.83			

Furthermore, the discriminant validity meets the criteria of Fornell and Larcker (1981), as the square roots of the AVE are greater than the respective correlation coefficients (see Table 2). Regarding the correlations, INC had a significant correlation with the control variable EDU and the independent variable LTO. RAD and PRC had a significant association with COL and UAI, while PRD had a significant association with EDU, COL and UAI (Tables 2 and 3).

Table 2. Correlation matrix of the main variables and discriminant validity.

Var.	Mean	SD	PDI	COL	UAI	MAS	LTO	IDL	INC	RAD	PRC	PRD
PDI	5.52	0.61	0.76									
COL	5.15	0.72	0.11	0.81								
UAI	3.09	0.90	0.24 **	0.01	0.81							
MAS	5.23	0.62	0.15	0.18 *	−0.00	0.76						
LTO	4.56	0.78	−0.02	0.01	−0.04	0.10	0.77					
IDL	4.89	0.73	0.03	0.15	0.19 *	−0.01	−0.02	0.75				
INC	4.01	0.52	−0.03	0.09	−0.06	0.05	0.23 **	0.05	0.81			
RAD	3.20	0.79	−0.13	−0.22 **	−0.29 ***	−0.08	0.04	0.03	0.30 ***	0.88		
PRC	3.72	0.61	−0.15	−0.29 ***	−0.17 *	−0.15	0.12	0.05	0.45 ***	0.41 ***	0.81	
PRD	3.81	0.57	−0.08	−0.18 *	−0.23 **	−0.07	0.14	−0.14	0.52 ***	0.40 ***	0.79 ***	0.83

Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 3. Correlation matrix of the control variables.

Var.	INC	RAD	PRC	PRD	SIZE	EDU	AGE	GDN
INC	-							
RAD	0.30 ***							
PRC	0.45 ***	0.41 ***						

Table 3. *Cont.*

Var.	INC	RAD	PRC	PRD	SIZE	EDU	AGE	GDN
PRD	0.52 ***	0.40 ***	0.79 ***					
SIZE	−0.01	0.04	0.09	0.02				
EDU	0.26 **	−0.03	0.09	0.18 *	−0.06			
AGE	−0.13	0.07	0.02	−0.01	0.26 **	−0.29 ***		
GND	0.16	0.11	0.14	0.07	−0.05	0.09	−0.30 ***	–

Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Linear regressions were used to identify the casual relationships between the standardized variables that showed a correlation. As shown in Table 4, the first model revealed that LTO ($\beta = 0.08$, $p > 0.05$) did not significantly predict the dependent variable INC. However, the second model significantly predicted RAD, as COL ($\beta = -0.21$, $p < 0.01$) and UAI ($\beta = -0.29$, $p < 0.001$) had a significant negative effect on the dependent variable. In the same strain, the third model significantly predicted PRC, with COL ($\beta = -0.26$, $p < 0.01$) and UAI ($\beta = -0.17$, $p < 0.05$) having a significant negative effect on innovation. Finally, the fourth model also significantly predicted PRD, with EDU ($\beta = 0.20$, $p < 0.05$) having a significant positive effect on the dependent variable, while COL ($\beta = -0.18$, $p < 0.05$) and UAI ($\beta = -0.23$, $p < 0.01$) had a significant negative effect.

Table 4. Multiple linear regressions.

	Model 1 (INC)	Model 2 (RAD)	Model 3 (PRC)	Model 4 (PRD)
Control variable				
EDU	0.19 *			0.20 *
Independent variables				
COL		−0.21 **	−0.26 **	−0.18 *
UAI		−0.29 ***	−0.17 *	−0.23 **
LTO	0.08			
R^2	0.05	0.13	0.10	0.12
F	3.71	10.18	7.36	6.29

Note: N = 142. Standardized coefficients are reported. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Based on the results above, H2b, H2c, H2d, H4b, H4c and H4d are supported as COL and UAI had a significant impact on the three types of innovation: radical, process and product innovation. However, the remaining hypotheses are not supported as PDI, MAS, LTO and IDL did not have a significant impact on any of the four types of innovation.

6. Discussion

This study reveals the impact of cultural values on innovation in the business context. The results indicate that two cultural values have a significant influence on the innovative practices of firms. In particular, collectivism and uncertainty avoidance have a significant negative impact on three out of four types of innovation: radical, process and product innovation.

First, the findings suggest that collectivism has a significant negative impact on three types of innovation (H2b, H2c and H2d supported). This means that managers who emphasize their personal ambitions and prioritize their own needs rather than those of the group are more likely to engage in innovation. These individuals are more likely to feel autonomous and independent, resulting in a creative mindset that can lead to innovative initiatives in an organization. Research indicates that managers with low levels of collectivism tend to have positive perceptions of sustainability initiatives [30]. Therefore, they are more likely to innovate in order to improve organizational performance in terms of sustainability. This finding is consistent with previous research. For instance, Desmarchelier

and Fang [53], who conducted research on innovation diffusion patterns, found a positive effect of individualism on diffusion rates. In addition, Griffith and Rubera [54] studied technological and design product innovations and found a positive impact of individualism on them. Shane [28] found that collectivism has a negative impact on national innovation rates, while Boubakri et al. [5] concluded that firms in individualistic societies tend to be more innovative than those in collectivistic societies.

Second, our research shows that uncertainty avoidance is a cultural value that has a significant negative impact on three types of innovation (H4b, H4c and H4d supported). Managers who are uncomfortable with ambiguity tend to adhere to formal rules, manage 'by the book' and avoid risk. These behaviors lead to fewer innovation initiatives, as innovation is a process of trial and error. On the contrary, managers with low levels of uncertainty avoidance dare to try new things, seize opportunities and engage in innovative practices. This finding is in line with the majority of previous studies in this area. For example, Shane [28] and Efrat [56] show that uncertainty avoidance has a negative impact on national innovation levels. Moreover, our finding is consistent with other studies that demonstrate that low uncertainty is positively associated with patent generation [6], technological innovation in enterprises [54] and business innovation practices [40].

7. Conclusions

To the best of the authors' knowledge, this is the first attempt to empirically examine the impact of Hofstede's six cultural values on four types of innovation at the firm level: incremental, radical, product and process innovation. This paper makes a significant contribution to both the cultural management and innovation management literature as we reveal a significant negative impact of collectivism and uncertainty avoidance on radical, product and process innovation. These insights add empirical evidence to the emerging calls in the field of innovation and the factors that influence innovative initiatives and practices. In addition, our findings build on the cultural values framework by examining its relationship with four types of innovation.

Furthermore, this study has new managerial implications as it highlights the complexity of factors that influence innovation. Innovations are more likely to be introduced by managers who are characterized as possessing high individualism and low uncertainty avoidance. As shown in previous research, cultural values and innovation have a significant impact on corporate sustainable development [12,30]; thus, managers should consider cultural values in terms of where and with whom they work in order to develop innovation which eventually will lead organizations to a better sustainability performance.

Despite the implications, our study has some specific limitations. First, our research is limited to a single country. Future company-level research should be conducted in other countries to support our findings. Second, although there is a statistically significant effect of cultural values on innovation, it is small (Table 4). Therefore, it is recommended to examine cultural values in combination with other variables, such as personality traits. Third, the measurement of innovation is based on the subjective opinions of the CEO. Future research should include key performance indicators of innovation. Finally, this study focuses on four types of technological innovation; future research can extend the investigation to types other than technological innovation.

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Appendix A

Scale items
Cultural Values:
Collectivism

- Group work is preferable to working alone.
- Groups arrive at better choices than individuals do.
- The most crucial component of work is making a contribution to the team.

Uncertainty Avoidance

- Regulations and guidelines must be explicit and comprehensive so that employees understand what is required.
- I become highly anxious if I am unsure of my job duties.
- I believe that straightforward rules should be followed when someone is evaluating me.

Power Distance

- Most choices should be made by my superiors without my input.
- I abide by the directives of my superiors.
- I think supervisors who ask subordinates for their opinions too frequently are either incompetent or inadequate.

Masculinity

- Working for a reputable and prosperous company or organization is vital to me.
- Having a job with the potential for big wages is vital to me.
- It is crucial that I perform better than others in my organization.

Long-term orientation

- I take great care to avoid doing anything wrong.
- I try not to offend people.
- If I act incorrectly, I feel bad.
- Older adults have my respect and reverence.

Indulgence

- I am a happy person.
- Nothing can prevent me from doing what I want.
- It is essential for me to keep time free for fun.
- I do not consider it important to have moderation/few desires.

Innovation:
Incremental innovation

- Innovations that strengthen your current products and/or services.
- Innovations that strengthen your current competencies in dominant products and/or services.
- Innovations that strengthen your current competitive position.

Radical innovation

- Innovations that make your current products and/or services redundant.
- Innovations that radically alter your current products and/or services.
- Innovations that make your current competencies in current products and/or services redundant.

Product Innovation

- The degree of novelty of our company's new products.

- The application of the most recent technological innovations in our new products.
- The pace of developing new products.
- The amount of new products our company has brought to the market.
- The amount of new products our company has brought to the market first.

Process Innovation

- The technological capability of our company.
- The pace at which we incorporate the newest technological innovations into our processes.
- The innovativeness of the technology used in our processes.
- The frequency of changes in our processes.
- The frequency of changes in technology.

Source: The authors' own adaptation from Hofstede [65], Prajogo and Sohal [63], Subramaniam and Youndt [4] and Vitell et al. [64].

References

1. Porter, M.E. Capital advantage: America's failing capital investment system. *Harvard Bus. Rev.* **1992**, *70*, 65–82.
2. Baer, M. Putting creativity to work: The implementation of creative ideas in organizations. *Acad. Manag. J.* **2012**, *55*, 1102–1119. [CrossRef]
3. Drucker, P.F. The discipline of innovation. *Harv. Bus. Rev.* **1998**, *76*, 149–157. [CrossRef] [PubMed]
4. Subramaniam, M.; Youndt, M.A. The influence of intellectual capital on the types of innovative capabilities. *Acad. Manag. J.* **2005**, *48*, 450–463. [CrossRef]
5. Boubakri, N.; Chkir, I.; Saadi, S.; Zhu, H. Does national culture affect corporate innovation? International evidence. *J. Corp. Financ.* **2021**, *66*, 101847. [CrossRef]
6. Chen, Y.; Podolski, E.J.; Veeraraghavan, M. National culture and corporate innovation. *Pac. Basin Financ. J.* **2017**, *43*, 173–187. [CrossRef]
7. Jourda, L.F.; Smith, M. National culture dimensions as predictors of innovation, creativity, and entrepreneurship. *J. Glob. Bus. Insights* **2021**, *6*, 154–171. [CrossRef]
8. Hirshleifer, D.; Low, A.; Teoh, S.H. Are overconfident CEOs better innovators? *J. Financ.* **2012**, *67*, 1457–1498. [CrossRef]
9. Chang, X.; Fu, K.; Low, A.; Zhang, W. Non-executive employee stock options and corporate innovation. *J. Financ. Econ.* **2015**, *115*, 168–188. [CrossRef]
10. Chen, Y.; Podoski, E.J.; Veeraraghavan, M. Does managerial ability facilitate innovation success? *J. Empir. Financ.* **2015**, *34*, 313–326. [CrossRef]
11. Cho, C.; Halford, J.T.; Hsu, S.; Ng, L. Do managers matter for corporate innovation? *J. Corp. Financ.* **2016**, *36*, 206–229. [CrossRef]
12. Agoraki, K.K.; Deirmentzoglou, G.A.; Psychalis, M.; Apostolopoulos, S. Types of Innovation and Sustainable Development: Evidence from Medium-and Large-Sized Firms. *Int. J. Innov. Technol. Manag.* **2023**, 2450013. [CrossRef]
13. Ferlito, R.; Faraci, R. Business model innovation for sustainability: A new framework. *Innov. Manag. Rev.* **2022**, *19*, 222–236. [CrossRef]
14. Oliveira-Dias, D.; Kneipp, J.M.; Bichueti, R.S.; Gomes, C.M. Fostering business model innovation for sustainability: A dynamic capabilities perspective. *Manag. Decis.* **2022**, *60*, 105–129. [CrossRef]
15. Yang, M.; Evans, S.; Vladimirova, D.; Rana, P. Value uncaptured perspective for sustainable business model innovation. *J. Clean. Prod.* **2017**, *140*, 1794–1804. [CrossRef]
16. Hechavarria, D.M. The impact of culture on national prevalence rates of social and commercial entrepreneurship. *Int. Entrep. Manag. J.* **2015**, *12*, 1025–1052. [CrossRef]
17. Krueger, N.F.; Carsrud, A.L. Entrepreneurial intentions: Applying the theory of planned behavior. *Entrep. Reg. Dev.* **1993**, *5*, 315–330. [CrossRef]
18. Wennberg, K.; Pathak, S.; Autio, E. How culture models the effects of selfefficacy and fear of failure on entrepreneurship. *Entrep. Reg. Dev.* **2013**, *25*, 756–780. [CrossRef]
19. Hofstede, G.; Hofstede, G.J.; Minkov, M. *Cultures and Organizations: Software for the Mind*; McGraw-Hill: New York, NY, USA, 2010.
20. Newberry, R.; Lean, J.; Moizer, J.; Haddoud, M. Enterpeneurial identity formation during the initial entrepreneurial experience: The influence of simulation feedback and existing identity. *J. Bus. Res.* **2018**, *85*, 51–59. [CrossRef]
21. Thurik, R.; Dejardin, M. The impact of culture on entrepreneurship. *Eur. Bus. Rev.* **2011**, *1*, 57–59.
22. Etzioni, A. Entrepreneurship, adaptation and legitimation. *J. Econ. Behav. Organ.* **1987**, *8*, 175–189. [CrossRef]
23. Fayolle, A.; Linan, F.; Moriano, J. Beyond entrepreneurial intentions: Values and motivations in entrepreneurship. *Int. Entrep. Manag. J.* **2014**, *10*, 679–689. [CrossRef]
24. Manso, G. Motivating innovation. *J. Financ.* **2011**, *66*, 1823–1860. [CrossRef]
25. Bloom, N.; Sadun, R.; Van Reenan, J. The organization of firms across countries. *Q. J. Econ.* **2012**, *127*, 1663–1705. [CrossRef]
26. Pistikou, V.; Flouros, F.; Deirmentzoglou, G.A.; Agoraki, K.K. Sustainability Reporting: Examining the Community Impact of the S&P500 Companies. *Sustainability* **2023**, *15*, 13681.
27. Uhlaner, L.; Thurik, R. Postmaterialism influencing total entrepreneurial activity across nations. *J. Evol. Econ.* **2007**, *17*, 161–185. [CrossRef]
28. Shane, S.A. Cultural influences on national rates of innovation. *J. Bus. Ventur.* **1993**, *8*, 59–73. [CrossRef]

29. Deirmentzoglou, G.; Agoraki, K.; Fousteris, A. Organizational Culture & Corporate Sustainable Development: Evidence from Greece. *Int. J. Bus. Soc. Sci.* **2020**, *11*, 92–98.
30. Deirmentzoglou, G.A.; Agoraki, K.A.; Patsoulis, P. The nexus between cultural values and perceptions of corporate sustainable development. *Soc. Responsib. J.* **2024**, *20*, 224–242. [CrossRef]
31. Kibler, E.; Kautonen, T.; Fink, M. Regional social legitimacy of entrepreneurship: Implications for entrepreneurial intention and start-up behavior. *Reg. Stud.* **2014**, *48*, 995–1015. [CrossRef]
32. Bergman, H.; Hundt, K.; Sternberg, R. What makes student entrepreuners?—On the relevance (and irrelevance) of the university and the regional context for student start-ups. *Small Bus. Econ.* **2016**, *47*, 53–76. [CrossRef]
33. Van Everdingen, Y.M.; Waarts, E. The effect of national culture on the adoption of innovations. *Mark. Lett.* **2003**, *14*, 217–232. [CrossRef]
34. Taylor, M.Z.; Wilson, S. Does culture still matter? The effects of individualism on national innovation rates. *J. Bus. Ventur.* **2012**, *27*, 234–247. [CrossRef]
35. Khan, R.; Cox, P. Country culture and national innovation. *Arch. Bus. Res.* **2017**, *5*, 85–101. [CrossRef]
36. Kaasa, A. Culture as a possible factor of innovation: Evidence from the European union and neighboring countries. In *Re-Thinking Diversity*; Springer: Berlin/Heidelberg, Germany, 2016; pp. 83–107.
37. Kroenke, A.; Ferreti, P.C.; Junior, J.T. O crescimento econômico sofre influência da inovação e da cultura nacional? *Estud. Do Cepe* **2018**, *48*, 146–161. [CrossRef]
38. Francischeto, L.L.; Neiva, E.R. Innovation in companies and cultural orientation to innovation: A multilevel study. *Rev. Adm. Mackenzie* **2019**, *20*, eRAMG190135. [CrossRef]
39. Bukowski, A.; Rudnicki, S. Not only individualism: The effects of long-term orientation and other cultural variables on national innovation success. *Cross Cult. Res.* **2019**, *53*, 119–162. [CrossRef]
40. Gallego-Álvarez, I.; Pucheta-Martínez, M.C. Hofstede's cultural dimensions and R&D intensity as an innovation strategy: A view from different institutional contexts. *Eurasian Bus. Rev.* **2021**, *11*, 191–220.
41. Bogatyreva, K.; Edelman, L.F.; Manolova, T.S.; Osiyevskyy, O.; Shirokova, G. When do entrepreneurial lead to actions? The role of national culture. *J. Bus. Res.* **2019**, *96*, 309–321. [CrossRef]
42. Hofstede, G. Culture and organizations. *Int. Stud. Manag. Organ.* **1980**, *10*, 15–41. [CrossRef]
43. Guiso, L.; Sapienza, P.; Zingales, L. Does culture affect economic outcomes? *J. Econ. Perspect.* **2006**, *20*, 23–48. [CrossRef]
44. Espig, A.; Mazzini, I.T.; Zimmermann, C.; Castro de Carvalho, L. National culture and innovation: A multidimensional analysis. *Innov. Manag. Rev.* **2022**, *19*, 322–338.
45. Strychalska-Rudzewicz, A. The impact of national culture on the level of innovation. *J. Intercult.* **2016**, *8*, 121–145. [CrossRef]
46. Lee, H.-S.; Chernikov, S.U.; Nagy, S.; Degtereva, E.A. The impact of national culture and innovation: A comparative analysis between developed and developing nations during the pre- and post-crisis period 2007–2021. *Soc. Sci.* **2022**, *11*, 522. [CrossRef]
47. Papula, J.; Kohnova, L.; Papudova, Z. Impact of national culture on innovation activities of companies: A case of Germany, Austria, Switzerland and the Czech Republic. *Econ. Ann.* **2018**, *169*, 26–30. [CrossRef]
48. Musrwieck, R.; Dragan, M.; Maftei, M.; Ivana, D.; Fortmuller, A. A study on the relationship between cultural dimensions and innovation performance in the European Union countries. *Appl. Econ.* **2020**, *52*, 2377–2391.
49. Bradley, F.; Gao, Y.; Sousa, C.M. A natural science approach to investigate cross-cultural managerial creativity. *Int. Bus. Rev.* **2013**, *22*, 839–855. [CrossRef]
50. Hsu, Y.; Hsu, L.; Yeh, C.W. A cross-cultural study on consumers' level of acceptance toward marketing innovativeness. *Afr. J. Bus. Manag.* **2010**, *4*, 1215.
51. Tian, M.; Deng, P.; Zhang, Y.; Salmador, M.P. How does culture influence innovation? A systematic literature review. *Manag. Decis.* **2018**, *56*, 1088–1107. [CrossRef]
52. Kaasa, A.; Vadi, M. How does culture contribute to innovation? Evidence from European countries. *Econ. Innov. New Technol.* **2010**, *19*, 583–604. [CrossRef]
53. Desmarchelier, B.; Fang, E.S. National culture and innovation diffusion. Exploratory insights from agent-based modeling. *Technol. Forecast. Soc. Chang.* **2016**, *105*, 121–128. [CrossRef]
54. Griffith, D.A.; Rubera, G. A cross-cultural investigation of new product strategies for technological and design innovations. *J. Int. Mark.* **2014**, *22*, 5–20. [CrossRef]
55. Erez, M.; Nouri, R. Creativity: The influence of cultural, social, and work contexts. *Manag. Organ. Rev.* **2010**, *6*, 351–370. [CrossRef]
56. Efrat, K. The direct and indirect impact of culture on innovation. *Technovation* **2014**, *34*, 12–20. [CrossRef]
57. Prim, A.L.; Filho, L.S.; Zamur, G.A.C.; Di Serio, L.C. The relationship between national culture dimensions and degree of innovation. *Int. J. Innov. Manag.* **2017**, *21*, 1730001. [CrossRef]
58. Rubino, M.; Vitolla, F.; Raimo, N.; Garcia-Sanchez, I.M. Cross-country differences in European firms' digitalisation: The role of national culture. *Manag. Decis.* **2020**, *58*, 1563–1583. [CrossRef]
59. Adams, R.; Bessant, J.; Phelps, R. Innovation management measurement: A review. *Int. J. Manag. Rev.* **2006**, *8*, 21–47. [CrossRef]
60. Sundbo, J. Management of innovation in services. *Serv. Ind. J.* **1997**, *17*, 432–455. [CrossRef]
61. Eurostat. More than Half EU Business Innovate. 2022. Available online: https://ec.europa.eu/eurostat/en/web/products-eurostat-news/-/DDN-20221118-2 (accessed on 22 January 2024).
62. European Commission. 2022 SME Country FACT Sheet—Greece. 2022. Available online: https://ggb.gr/sites/default/files/basic-page-files/Greece%20-%20SME%20Fact%20Sheet%202022.pdf (accessed on 22 January 2024).

63. Prajogo, D.I.; Sohal, A.S. The integration of TQM and technology/R&D management in determining quality and innovation performance. *Omega* **2006**, *34*, 296–312.
64. Vitell, S.J. Consumer ethics research: Review, synthesis and suggestions for the future. *J. Bus. Ethics* **2003**, *43*, 33–47. [CrossRef]
65. Hofstede, G. Values Survey Module 2013 Questionnaire. 2013. Available online: https://geerthofstede.com/wp-content/uploads/2016/07/VSM-2013-English-2013-08-25.pdf (accessed on 25 January 2024).