

Article

# Sustainable Business Practices and the Role of Digital Technologies: A Cross-Regional Analysis

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**Abstract:** This study examines the relationship between digital transformation and sustainable practices within enterprises against the backdrop of global transformative forces framed within the holistic paradigm of systems thinking. It examines the extent to which digital advances either facilitate or impede the sustainable development of companies, while also considering the systemic impact of demographic variables (such as gender, age, education), national income levels, and geographical regions on business sustainability. Using data from the Global Entrepreneurship Monitor (GEM), which encompasses 26,790 entrepreneurs in 47 countries, this research uses multinomial regression to assess how these factors influence companies' commitment to social and environmental goals. A key finding is that the strategic use of digital technologies in sales processes significantly increases the likelihood that entrepreneurs will integrate social and environmental considerations into their decision-making. Notably, this conscientious approach to business is most prevalent among entrepreneurs in Latin America and the Caribbean. Our findings underscore the central role of digital technologies in driving sustainable business transformation while also highlighting the significant influence of regional socio-environmental contexts on business sustainability orientations.

**Keywords:** digital transformation; sustainable transformation; digitainability; enterprises; demographic factors; country income; geographical regions; multinomial regression; Cramer's V



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## 1. Introduction

The Global Risk Report 2023 expresses eight risks out of the ten most important risks for the next decade, which relate to overuse of natural resources, climate changes, pollution, destroying biodiversity, and increasing inequality [1]. These will be much more distinct because of the increasing global population, which will reach 8.5 billion by 2030 [2]. These environmental and social risks are holistically tied to the shortfall in achieving the 17 sustainable development goals (SDGs), which were set by the United Nations in Agenda 2030 and to which the member states of this organization have committed themselves [3]. National policies play the most important role in achieving these goals and must actively connect all stakeholders in business, society, and government to create and include them in actions to achieve the SDGs [4]. Additional pressure for governments is being created by the younger generation, which is becoming more and more aware of the importance of sustainability [5]. The improvements contributing to global achievement of the SDGs have stopped in the last two years because of slower economic recovery after the pandemic in poorer countries; and the richer countries have faced even more problems associated with the negative impacts of unsustainable trade and supply chains. But also, progress before the pandemic was not fast enough to allow the SDGs to be achieved by 2030 [6].

The pursuit of sustainability in different societal aspects is happening at the same time as a period of rapid digital technological advancement, which has a profound influence on society as a whole. This intersection presents challenges and opportunities, as digital technologies can significantly alter economic, social, and environmental landscapes. Innovations such as artificial intelligence, big data analytics, and blockchain offer transformative

solutions for sustainable development challenges. They can enhance energy efficiency, promote inclusive economic growth, and aid environmental conservation. However, the digital revolution also raises concerns about resource consumption, e-waste, and digital divides that could worsen inequalities. Navigating this complex landscape requires a systemic approach with a precise understanding of how digital technologies can be used to promote sustainability, ensuring that technological progress contributes positively to societal well-being and environmental protection. Digital technologies also change business processes through artificial intelligence, blockchain technology, cloud computing, internet of things, 5G network, quantum and edge computing, enabling robotics and automation of production, 3D printing, creation of virtual reality, remote asset management, cyber security and big data processing, which are becoming even more important during the fourth industrial revolution [7]. With all the mentioned possibilities of using digital technology, it also has far-reaching and transforming effects, because it changes people's daily habits and improves their quality of life [8,9]. As a consequence, companies have to adapt by providing new innovative products and services; but at the same time, digitalization also offers options for process and other types of innovations [10,11]. Transformation is also manifested in the fact that innovations can grow into new business models, for example, digital entrepreneurship [12,13].

Achieving sustainability and embracing digitalization are important for transforming society. The question that arises is whether the transformative forces of sustainability and digitalization are complementary. That is, it must be determined whether the transformation of both leads to the same development of society, or whether the forces are contradictory, which means that the SDGs cannot be achieved if society accepts digitalization. The connection between digitalization and sustainability is not clearly explained, because the literature explains contradictory impacts digitalization on sustainable business. Despite the already mentioned benefits, digitalization has also many negative effects on society and the environment [14–16]. Therefore, the net impact of digitalization is not clear. For example, digital solutions enable companies to use energy more efficiently and produce less CO<sub>2</sub> emissions [17,18], but on the other hand, they use electricity and, as a consequence, their carbon footprint increases [19]. Because of this, the net effect of digital technologies on using electricity and producing carbon footprint remains unclear [20]. What is also unclear is the impact of digitalization on social aspects, because digital technologies replace workers, but at the same time, workers become more productive when using digital technologies, which enables them to earn a higher income [15]. Given the diverse and occasionally conflicting impacts of digitalization on sustainability, additional research is necessary to comprehensively understand and navigate these challenges.

In the evolving landscape of entrepreneurship, the integration of systems thinking provides a comprehensive lens through which to understand and analyze the complex interplay of digital technologies and sustainable business practices. Rooted in the foundational theories of Bertalanffy [21] and Wiener [22], systems thinking provides a holistic approach that recognizes the interconnectedness and interdependencies within entrepreneurial ecosystems. This perspective is particularly essential in the context of digital transformation, where the rapid pace of technological innovation and the imperative for sustainability are reshaping business models and strategies. By applying systems thinking, this paper seeks to unravel the systemic interactions and feedback loops between digital technologies and sustainable practices, offering insights into how these elements co-evolve and influence each other within the broader entrepreneurial landscape. This approach not only aligns with the contemporary challenges and dynamics of global entrepreneurship but also contributes to a deeper, more integrative understanding of how businesses can thrive in a digitally transformed and environmentally conscious world.

In this research, we focused on the importance of introducing digital technologies among entrepreneurs for sustainable business practices. This research has to be separate from the digitalization and sustainability of bigger companies because these face the mentioned transformations in different ways because of their specific organizational

structure and company sizes. An entrepreneur has an important role in how a company faces digitalization and sustainability, and because of this, the entrepreneur's knowledge, feelings and perception of the advantages of the mentioned transformations are important. Small and medium companies (SMEs) have a problem regarding a lack of employees with corresponding knowledge who can lead the transformation process. The business transformation requires additional financial sources, which are less accessible for SME. An aspect of company exposure is also important because SMEs are less exposed in society and as a consequence, they feel less pressure to change their business practices. At the same time, entrepreneurs think their companies do not have important impacts on society [23,24].

In our study, alongside digital technologies, we also examine the influence of demographic factors (gender, age, education) and the economic development of countries on sustainable business practices. Demographic factors have been extensively studied in relation to sustainability in business, but when limiting ourselves to research that specifically addresses the environmental aspect of sustainability, the findings are quite ambiguous [25–27]. Furthermore, there are only a handful of studies that link demographic factors to the social aspect of sustainability [28–30]; therefore, no research addresses age. We also pay attention to identifying differences between four geographical regions worldwide concerning the prevalence of considering sustainability implications in the future of various companies. Based on our literature review, we have found no studies that compare entrepreneurs in different geographic regions in terms of sustainability orientation.

Consequently, the aim of this study is to determine how selected factors impact the pursuit of social, environmental, or both implications simultaneously in companies' plans. We place particular emphasis on digital transformation. We observe that the existing literature does not place adequate focus on the significance of digitalization in guiding companies towards achieving social and environmental aspects of sustainability. Research in this area can be divided into two groups: those addressing individual aspects of sustainability [31–33], and those addressing the impact of digitalization on sustainable business as a whole [34,35], with studies in both groups being relatively scarce. Our study will be the first to analyze the influences of selected factors on the pursuit of only environmental, only social, or both types of implications simultaneously. With this approach, we contribute to the separate analysis of sustainable companies based on the group of implications they pursue, as well as their overall sustainability orientation.

The article begins with a comprehensive review of the existing literature, emphasizing the critical role of digitalization and sustainability in contemporary business practices. This foundational overview sets the stage for the subsequent development of hypotheses aimed at exploring the interplay between digitalization and sustainable business initiatives. It delves into an examination of various demographic factors, geographic regions, and income levels to assess their influence on sustainable business practices. Based on these findings, hypotheses are developed for empirical testing. In the third chapter, the article presents the research methodology used, detailing the approach to data collection that underpins the empirical aspect of the study. The fourth chapter presents the results of the statistical analysis, providing a quantitative evaluation of the hypotheses. The discussion that follows interprets the results from the analysis and integrates them into the broader context of digitization and sustainability in business operations. The article concludes with a reflection on the limitations of the study, providing an assessment of potential limitations and biases. It also offers a forward-looking perspective, suggesting future research that could further explore the dynamic relationship between digitization, sustainability, and business success.

## 2. Literature Review

The integration of systems thinking into the entrepreneurial domain, particularly in the context of digital transformation and the imperative for sustainability, has attracted considerable attention in contemporary research. Scholars are showing increasing recognition of the utility of systems thinking for unraveling the intricate web of challenges that

characterize today's entrepreneurial ventures [36–39]. This paradigm advocates viewing firms not as stand-alone entities, but as components of a broader, interdependent ecosystem that includes multiple stakeholders, processes, and environmental considerations. Recent scholarship has used this lens to analyze the interplay between digital innovation and sustainability efforts within these ecosystems, revealing complex dynamics, including unexpected outcomes and feedback loops, that are redefining the business environment. The adoption of a comprehensive approach is emphasized as crucial for navigating the complexities and capitalize on the opportunities that the digital era has brought to the field of sustainable entrepreneurship.

Furthermore, the discourse in the literature emphasizes how systems thinking catalyzes a culture of innovation and flexibility within entrepreneurial networks. Several studies [37,40,41] have highlighted how systems thinking facilitates the identification of nodes within these networks, where targeted actions can have profound effects. Research on digital technologies and sustainability underscores that advances in these areas often require changes in policies, consumer attitudes, and business strategies, all of which are interrelated facets of the entrepreneurial ecosystem. It is imperative that entrepreneurs, policymakers, and educators work together to cultivate an environment that is resilient, adaptable, and conducive to sustainable growth during rapid technological advances.

### *2.1. Sustainable Transformation and the Need for Systems Thinking Approaches*

The United Nations defined sustainability as a concept of meeting humanity's needs without harming our ability to meet the same needs in the future. This means that the consumption of the Earth's resources should not exceed the recovery of such resources [42]. Sustainability is a complex concept consisting of three aspects, which relate to the SDGs. Financial aspects can be divided in two categories. The first is the financial success of the companies, which is related to cost reduction, increasing productivity, and innovations, and the second is related to economic quality of life, described by one's living standards [3,43]. The society aspect emphasizes quality of life, which effects the quality of health services and education; social equality is another important goal. The environmental aspect focuses on keeping the environment clean and on achieving biodiversity, sustainable use of energy, recycling materials, and prevention of climate change [3].

The complex and multidimensional development of society require radical changes in its functioning, which will be influenced by innovations. Therefore, companies play an important role in creating innovative solutions to achieve sustainable goals through their sustainable orientation, search for new business opportunities, and innovations [44,45]. Sustainable radical innovations are the most important, as they lead to systemic changes in business and society [46]. They establish new business models, such as the circular economy, where products are designed for repair and recycling, enabling the reuse of materials. These innovations also prioritize the elimination of dangerous substances and the use of renewable energy [47]. The sharing economy is sustainably oriented because it offers rental services for assets, allowing for increased usage and decreased consumption due to fewer purchases [48]. Social entrepreneurs also play a crucial role in achieving sustainable goals through their business models [49]. For example, social entrepreneurship provides employment opportunities for individuals who may not have the necessary skills or are unable to find suitable jobs [50]. It also offers support to those in need and helps them find suitable housing [51]. Additionally, it promotes environmental projects aimed at reducing emissions and pollution [52].

Sustainability on the company level is defined as the company's commitment to addressing the economic, social, and environmental needs of its stakeholders, which include shareholders, employees, customers, and society at large, while ensuring that these needs can continue to be met in the future without compromise [53]. Sustainable business requires the integration of all three aspects of sustainability: economic, social, and environmental. Focusing on a single aspect alone cannot achieve sustainability. It is essential to achieve a harmonious balance between these dimensions [54]. Entrepreneurs

running established companies often prioritize economic performance and personal gain to mitigate the risk of failure, leading them to overlook the importance of sustainable business practices.

Society is becoming increasingly aware of the importance of sustainable behavior [55,56], which forces companies to adapt to this trend. As a consequence, companies put pressure on other companies in the supply chain to adapt their services, semi-finished products, and materials to meet the sustainability goals [57]. Changes in the perception of sustainability are expressed in the decisions of governments, which create rules that direct companies toward sustainable development [6,58]. Sustainable business has also become important for investors [59].

Despite all the mentioned pressures, companies should be motivated toward sustainable business because a positive connection between sustainable business and financial success of a company has been confirmed many times [60]. What is more, sustainable orientation has a positive impact on the competitive advantages of companies. Sustainable transformation is inhibited by entrepreneurs' poor awareness about the importance and benefits of sustainable business [61,62]. Entrepreneurs who are aware of the importance of sustainability face similar problems when starting sustainable and digital transformation. They do not have enough financial resources and knowledge to make changes in business [23]. Big investments in digital or sustainable transformation will impair competitiveness in the short term if other companies do not follow the transformation process, and because of this, companies hesitate to start along the path of digital or sustainable transformation [63].

Sustainable transformation is complex due to the interdependencies between economic, social, and environmental dimensions. Therefore, a systems-thinking approach is necessary to achieve a comprehensive understanding and strategic navigation of the challenges and opportunities presented by companies' sustainability initiatives. Incorporating systems thinking into the journey towards sustainable transformation offers a fundamental shift in how companies approach the interrelated challenges and opportunities of economic, social, and environmental sustainability. Systems thinking promotes a holistic view that recognizes the interrelatedness of the components of a sustainable business model, from resource management and supply chain logistics to stakeholder engagement and the product lifecycle [64,65]. This perspective enables companies to identify leverage points within their systems where targeted interventions can lead to significant, positive change across the board. For example, by applying systems thinking, a company can see how a change in product design to reduce material waste can not only reduce costs but also enhance brand reputation, attract environmentally conscious consumers, and reduce regulatory risk, creating a spillover effect that benefits the whole system.

The systems-thinking approach emphasizes the significance of feedback loops in comprehending the effect of business decisions on sustainability goals [66,67]. Feedback loops enable companies to learn and adjust continuously by monitoring the outcomes of their actions and making necessary adjustments. This adaptability is crucial in the face of the rapid technological advances and changing regulatory and market landscapes that characterize the digital age. For instance, companies can utilize data analytics to gain insights into consumer behavior and preferences. This enables them to tailor their sustainability initiatives more effectively and align them with market demands. By promoting a culture of innovation and adaptability informed by systems thinking, companies can effectively navigate the complexities of sustainable transformation and ensure that their strategies are resilient, responsive, and aligned with broader sustainable development goals.

## 2.2. Digital Transformation

The process of digitalization in companies is complex and takes place on several levels. The first level is digitization, which refers to converting analog data into digital data. This rationalizes business activity with reducing costs, but it does not change the way value is created in a company. The next level is digitalization, within which digital technologies

are included in business processes (connection, automatization) and also in products and services, which reduce costs and create added value. The most complex level is digital transformation, which refers to introducing new business models and not just digitalizing the existing ones. This is a process to which the entire operation of the company is subjected, where data collection and advanced analysis of big data are also important, despite the effects mentioned above [68]. This means that companies change and create new business models with digital transformation, where an important part of added value is created by digital technologies [69].

Digitalization encourages innovativeness, which enables a lot of new business opportunities, which have positive impacts on entrepreneurial intention. Digital technologies have an impact on business process because they enable the reduction of costs of production and the creation of new products [70,71], which strengthens competition and enables the companies to maintain their position in the market [68]. As a consequence, digitalization has a positive impact on productivity [72], growth of sale [10,73], exportation [74], and profit [75], which are reflected in the level of economy with higher economic growth [76,77]. Digitalization provides companies with more options for financing, for example, crowdfunding platforms [78]. Digital technologies help companies to fulfil their legal obligations, for example, paying taxes or forwarding different information [79].

With all the aforementioned motivational factors for digitalization of business, the latter is also accelerated by the pressure of customers, who expect companies to include the newest digital technologies in their business processes and products or services [68]. Digital technologies enable the customers to reduce the asymmetry of information and costs of searching, negotiations, and transactions [35]. Additionally, they enable quicker and more direct communication with customers and create personalized offers, which require efficient collection and analysis of customers' data [80]. Digitalization also enables easier diversification and adaptability of business [81,82], which enables the companies to better adapt to customers and to be more resilient to market changes. Business partners can also pressure companies to adapt to digital technologies when they wish for a company to accept equal or compatible information systems [83].

Digital technologies require many financial resources [84]. What is more, it requires that the company have knowledge of which technology to select, how to introduce it, and how to use it. Therefore, digitalization does not require just digital literacy, but also the ability to find digital technologies and judge their relative advantages, strategically planning and leading their projects [47,85].

### 2.3. Digitainability

Unsustainable practices can be understood as a failure of the market, which offers new business opportunities [86]. That means companies do not need to have knowledge about the capabilities of digital technologies or sustainability, but the combination of these skills and the ability to make critical judgments helps them to create digitally sustainable business models [87]. Because of the importance of digital and sustainable transformation, the expression digitainability has been used, which includes the common effects of digital and sustainable development. Digitainability means that a company achieves sustainable and digital goals; therefore, digitainability includes a cross-section of digital and sustainable effects, which are rarely caused by digitalization and have a positive impact on achieving sustainable goals [88].

The universal impact of digitalization of sustainable development is increasing productivity, which enables employees to earn a higher income and reduces the risk of poverty [15,72]. Digital entrepreneurship enables the entrepreneurs to have better anonymity and, as a consequence, offers an easier inclusion in entrepreneurship for groups of people who will be discriminated against in traditional entrepreneurship [71]. Digital technologies are also helpful for people who struggle to take care of themselves or have difficulties being included in society because of their disabilities [89]. Digital technologies help to contribute more efficient recycling of waste [14], and because of this, digital innovations have a positive

impact on the economic cycle [47]. Additionally, digitalization reduces the consumption of materials because it reduces the number of mistakes made in production [90] and it enables more accurate use of materials (3D printing) [47,48] and reduces waste production [17]. Digital technologies and their connected innovations help to more efficiently control and reduce air and water pollution [14]. Digitalization helps us to achieve more efficient energy use in many fields, such as waste processing, optimization of supply chains, production, logistics, and economy of residences, which in turn reduces CO<sub>2</sub> emissions [14,18,20].

On the other hand, hardware, which is used for digital technologies, is electronic waste, which is difficult to recycle [14]. What is more, software requires electricity to run, which creates greenhouse gases [19]. Higher productivity, which is caused by digitalization, increases consumption and the use of resources and energy [91]. Higher consumption is encouraged by the shorter life cycle of products, which has become shorter in the time of digitalization, despite expectations that technologies will improve the quality of products and extend their life cycle [31,92]. Digital technologies are too expensive for some entrepreneurs or they do not have enough knowledge to use them, which weakens their competitiveness in the long run [93,94]. Additionally, digitalization increases the amount of time that employees spend watching monitors, which can be harmful to their health [87]. Digital transformation changes occupations or even replaces them, forcing people to train to use digital technologies, which not everyone is capable of, or to look for new, lower-paid work, increasing income inequality [15]. Also, the use of digital innovations is often related to the fact that the consumer must have a basic digital infrastructure, which less affluent people cannot afford, which also increases inequality [16].

The research we have highlighted so far has focused on the importance of digitization for a specific field (emissions CO<sub>2</sub>, recycling, inequality in society, etc.) while there is not much research about the general impact of digitalization on sustainable business. Lammers et al. [31] studied the orientation of technological startups to sustainable goals. They found out that technological companies are more likely to pursue economic goals and less likely to pursue social and environmental goals compared to non-technological companies. Dabbous et al. [34] focused on sustainable competitiveness and also discovered that digitalization of business has positive effect on sustainable competitiveness. Similar findings were discovered at the level of the economy [35] because the digitalization of economy has a positive effect on the sustainable development of companies.

Ha et al. [32] concluded that the digitization of business has a positive impact on the achievement of environmental goals. They also analyzed its short-term and long-term effects, and they discovered that the digitalization of business has a negative impact on human health in the short term and a positive impact in the long term, while the long-term and short-term impact on the protection of the ecosystem was not statistically significant.

Malaquias et al. [79] focused on social responsibility, which they divided into economic, legal, ethical, and discretionary responsibility. They detected a statistically significant positive impact of the use of information technology on all four aspects of social responsibility.

Vrontis et al. [33] investigated the impact of five different digital technologies on the creation of economic and social value in companies. They found that all the analyzed technologies had a positive impact on economic and social value, except for the impact of blockchain technology on economic value, where the connection was not statistically significant.

Based on the literature review presented, it is evident that numerous studies focus on the significance of digitalization in achieving specific social and environmental impacts. Furthermore, numerous studies have examined the negative effects of digitalization on specific areas. However, it is not possible to infer the overall impact of digital transformation on the sustainability of business operations solely from these focused studies [20]. To understand the general impact of digital transformation on achieving sustainability goals, more generalizable studies are required. Unfortunately, such studies have been limited thus far, and are presented in this chapter. Nevertheless, much of this research differs from ours with the context of research. For example, Lammers et al. [31] focus on the sustainability orientation of technological startups, while Dabbous et al. [34] and Zhou et al. [35] examine

sustainable business as a whole, and Malaquias [79] investigates specific components of the social aspect of sustainability. The two remaining studies indicate that digitalization has a positive impact on the economic and social aspects of sustainability [33], as well as environmental aspects [32]. While the economic aspect has been extensively researched in previous studies that were not primarily focused on sustainability [10,68,72–75], the other two aspects have been overlooked. Our research aims to address this gap. Based on studies by Vrontis et al. [33] and Ha et al. [32], as well as more general research on the importance of digitalization for sustainability, which also acknowledges a positive impact [34,35], we propose the following hypotheses:

**H1a.** *Planning digitalization in sales increases the likelihood of companies considering social implications when they make decisions about the future.*

**H1b.** *Planning digitalization in sales increases the likelihood of companies considering environmental implications when they make decisions about the future.*

#### 2.4. Demographic Factors

The impacts of demographic factors such as gender, age, and education on sustainability aspects have been examined in studies that directly focus on these factors, as well as in research where these factors serve as control variables, which enables the investigation of their effects alongside numerous other explanatory variables. System thinking offers a broader perspective in understanding the complex interactions between demographic factors and sustainability. By considering these demographic variables not just in isolation but as part of a wider, interconnected system, researchers can better grasp the multifaceted influences on sustainable practices. This approach highlights how individual behaviors and societal norms collectively shape the sustainability landscape, encouraging a more holistic view of how gender, age, and education contribute to environmental and social entrepreneurship. Through system thinking, we can appreciate the nuanced ways in which these demographic factors interplay with cultural, economic, and environmental systems to influence sustainability outcomes, thereby providing a more comprehensive understanding of the dynamics at play. Among these demographic factors, gender's influence on sustainability in business has been the subject of extensive research. Studies consistently find that female entrepreneurs are more socially oriented than male entrepreneurs [29,95]. Similarly, among students, males show less interest in social entrepreneurship [28]. However, findings on the environmental aspect of sustainability have been less consistent. While some researchers suggest that female entrepreneurs are more committed to environmental sustainability than male entrepreneurs [25,27,95,96], other studies have not shown a connection between the gender of the entrepreneur and the environmental orientation of their business [26,29]. Nicolás et al. [97] also state that female entrepreneurs pursue sustainable goals less often. Notably, Hechavarria et al.'s [29] research reveals that the ratio of women to men entrepreneurs pursuing environmental goals is higher than that for pursuing economic goals. Similar trends have been observed for social goals. It has been found that women, in general, are more inclined towards sustainable business practices than men [98,99]. Furthermore, it has been found that businesses led by women exhibit more a positive link between sustainability entrepreneurship and overall business success [28].

The presented results of prior research show that female entrepreneurs are more inclined towards social entrepreneurship. However, their commitment to environmental issues is less clear, although the prevailing trend indicates that female entrepreneurs are more environmentally conscious than their male counterparts. Consequently, we propose the following hypotheses:

**H2a.** *Female entrepreneurs more frequently enhance the social sustainability aspects when they make decisions about the future.*

**H2b.** *Female entrepreneurs more frequently enhance the environmental sustainability aspects when they make decisions about the future.*

On the other hand, findings regarding the influence of an entrepreneur's age on sustainability in business are considerably more diverse. It has been observed that as an entrepreneur's age increases, so does their likelihood of pursuing social objectives [29]. Similarly, Bawakyillenuo & Agbelie [25] and Hechavarria et al. [29] have reported that older entrepreneurs are more environmentally oriented, as younger entrepreneurs tend to prioritize profitability [100]. Marín et al. [99] note that sustainability orientation in entrepreneurs increases with age. Nevertheless, some studies argue otherwise, suggesting that younger managers tend to be more socially and environmentally inclined [98,101]. Additionally, older entrepreneurs have been found to be less likely to pursue environmental goals [27]. Amid these contradicting findings, certain studies maintain that an entrepreneur's age is not associated with achieving environmental goals [26] and does not impact their likelihood of pursuing sustainability-oriented entrepreneurship [97].

Due to highly diverse findings regarding the impact of age on the social and environmental orientation of entrepreneurs, it is possible to conclude that there is no effect of age on the sustainability orientation of entrepreneurs. Consequently, we propose the following two hypotheses:

**H3a.** *The age of entrepreneurs does not influence their likelihood of considering social implications when they make decisions about the future of business.*

**H3b.** *The age of entrepreneurs does not influence their likelihood of considering environmental implications when they make decisions about the future of business.*

Previous research indicates that better-educated entrepreneurs are more likely to pursue social objectives [29] and engage in social entrepreneurship [30]. This pattern extends to the pursuit of environmental goals [25,27]. However, some studies, such as that of Hechavarria et al. [29], did not find a significant impact of education on the likelihood of achieving environmental objectives. Numerous other studies have also demonstrated the existence of a positive impact of education on a company's focus on sustainable business [97–99]. Consequently, we propose the following hypotheses:

**H4a.** *Better-educated entrepreneurs more frequently enhance social sustainability aspects when they make decisions about the future.*

**H4b.** *Better-educated entrepreneurs more frequently enhance environmental sustainability aspects when they make decisions about the future.*

## 2.5. Regions

Based on our literature review, we observe that there is limited research on the level of sustainability orientation among entrepreneurs across different regions worldwide. Studies exploring the factors enhancing the sustainability orientation of businesses are numerous, but their findings are fragmented due to their focus on various factors. Additionally, there is a lack of research that employs data from countries across different regions, which could help identify common trends in sustainable entrepreneurship worldwide. In our study, we focus on regions defined in the GEM database, namely (1) Europe and North America, (2) the Middle East and Africa, (3) Asia, (4) Latin America, and the Caribbean. As Table 1 illustrates, countries in the European and North American region perform best in achieving SDGs, largely due to the higher development level in this region making it easier them to attain economic aspects of sustainability compared to other regions. The remaining three regions have similar SDG achievement levels.

Education, competencies, skills, and training are among the most frequently examined factors when it comes to promoting sustainable entrepreneurship. We have already noted

the importance of education in terms of demographic factors, but we also add that the success of sustainable business is also positively influenced by the skills of entrepreneurs [102]. Moreover, promoting education on sustainability issues among students is linked to a higher sustainability orientation among young entrepreneurs [103,104], which can vary across countries and regions. Skills and experience in sustainability-related fields are also positively associated with the development of sustainable entrepreneurship [105,106]. Another extensively studied factor is innovation, which is found to have a positive impact on the success of sustainable business operations [102,107–110]. Furthermore, motivation, ambition, and altruistic attitudes of individuals are highlighted as significant factors in sustainable entrepreneurship [102,106,111]. Sustainable entrepreneurship and its success are also fostered by extensive business networks and broader social connections among entrepreneurs [102,110]. Additionally, governmental regulation and institutional support play a significant role in driving sustainable entrepreneurship [110,112]. System thinking allows for a deeper exploration of how these factors—education, innovation, motivation, networks, and governmental support—interact within the entrepreneurial ecosystem. By adopting this holistic approach, it becomes evident that sustainable entrepreneurship is not the result of isolated factors but a complex interplay of multiple elements. This perspective helps in the identification of synergies and potential conflicts between different sustainability drivers, enabling more effective and comprehensive strategies for fostering sustainable entrepreneurship.

Furthermore, it has been observed that traditional societies tend to encourage mass entrepreneurship and financial success, while post-materialistic societies exhibit lower rates of new business creation [113,114]. Secular societies are more focused on establishing social enterprises [115].

Among all the significant factors influencing sustainable entrepreneurship, data are available for only a few factors collected on a global scale, allowing for regional comparisons, as presented in Table 1. As shown, the Latin American and Caribbean region has the highest percentage of entrepreneurs motivated by altruism, and more than half of the entrepreneurs in Middle Eastern and African region are pursuing this motive. This corresponds to the fact that these regions include the countries in the GEM which are the most challenged by social and environmental issues, while the European and North American region experiences fewer and less severe issues. These findings align with previous research by Sarma et al. [106], which indicates that sustainable entrepreneurship is more prevalent where individuals have experience dealing with social and environmental issues. It is worth noting that Latin America and the Caribbean region have made the most significant progress among all regions in achieving the SDGs (SDG spillovers in Table 1), followed by the Middle East, Africa, and Asia. Europe and North America have achieved considerably less progress. Referring to Hechavarría's [115] findings, the largest proportion of people with secular values is in Asia and Europe and North America, from which it can be concluded that there are the most social entrepreneurs among all entrepreneurs in Asia and Europe and North America. There are only three percentage points fewer people with secular values in the countries of Latin America and the Caribbean, which means that the number of social entrepreneurs is not significantly lower than in the aforementioned regions. Based on these observations, we propose the following hypotheses:

**H5a.** *Entrepreneurs in the Latin America and the Caribbean region are more likely to pursue the social aspect of sustainability when they make decisions about the future, compared to other regions.*

**H5b.** *Entrepreneurs in the Latin America and the Caribbean region are more likely to pursue the environmental aspect of sustainability when they make decisions about the future, compared to other regions.*

**Table 1.** Characteristics of the analyzed regions.

	Middle East and Africa	Asia	Latin America and the Caribbean	Europe and North America
SDG <sup>1</sup>	68.14	69.81	69.87	79.81
The importance of the altruistic motive <sup>2</sup>	52.10%	30.9%	62.6%	37.0%
SDG spillovers <sup>1</sup>	82.21	82.03	90.51	66.47
People with secular values <sup>1</sup>	3.07%	15.33%	12.22%	15.28%

<sup>1</sup> The data are calculated as an average of the countries included in each region. <sup>2</sup> The data are calculated at the level of entrepreneurs involved in each region. Source: [116–118].

### 2.6. Income

Since the regions under consideration are not structured based on the income criterion, which is particularly evident in the income-diverse regions of Asia and the Middle East and Africa, we also need to separately address the factor of a country's development. Moreover, the inclusion of a separate income factor allows for a better understanding of geographical and cultural influences cleansed from the income-related effects within the analyzed regions. Prior research suggests that countries with higher income levels also exhibit a higher degree of sustainability-oriented entrepreneurship [99]. Societies more focused on survival tend to have more pronounced commercial entrepreneurship [115]. This indirectly confirms the finding that, in welfare-oriented societies, more entrepreneurs are motivated by opportunity rather than necessity [113]. Institutional support is also crucial for sustainable entrepreneurship [112], which wealthier countries can more readily provide, especially in the form of financial incentives. These countries can also invest more in research and development, enabling the development of more sustainable technologies and business models. Moreover, financial resources are also important for sustainable entrepreneurship [102]. The availability of resources for investments in potentially less profitable sustainable business models is more abundant in more developed countries, where capital accumulation is greater. System thinking offers a comprehensive lens through which the complex interplay between income levels, geographical regions, and sustainable entrepreneurship can be better understood. By considering the systems within which these factors interact, we can appreciate that changes in one area, such as increased institutional support or financial investment in sustainable technologies, can have cascading effects throughout the entire system. Consequently, we conclude that in more developed countries, sustainable entrepreneurship is also more prevalent, thus proposing the following hypotheses:

**H6a.** *In countries with higher incomes, it is more likely that entrepreneurs will consider social implications when they make decisions about the future, compared to countries with lower incomes.*

**H6b.** *In countries with higher incomes, it is more likely that entrepreneurs will consider social implications when they make decisions about the future, compared to countries with lower incomes.*

## 3. Methodology

### 3.1. Data

In this study, we used data from the GEM database, collected in 2022, including 26,790 entrepreneurs aged between 18 and 64 years from 47 countries. GEM is the largest survey of entrepreneurship globally. The survey is conducted by the Global Entrepreneurship Research Association. National teams composed of academic institutions or local universities collect data for their country. Data collection is coordinated by the Global Entrepreneurship Research Association, which ensures data quality and comparability by issuing collection requests prior to collection and reviewing collected data to ensure that they meet GEM requirements [119]. The samples for each country are representative of age and geographic regions, consisting of at least 2000 adults. Data are collected through telephone or face-to-face interviews at various times throughout the day and season [120].

We incorporated six explanatory variables into the model. The variable for digital technologies was measured by asking whether entrepreneurs expected to engage in greater use of digital technologies in sales in the next six months. This variable is dichotomous, with a value of 1 for affirmative responses and 0 for negative responses. The reference category is a value of 0.

As explanatory variables, we considered demographic factors such as gender, education, and age. The education variable was dichotomous, with a value of 0 for entrepreneurs with a secondary school diploma or lower and 1 for those with education beyond secondary school. We also created a dichotomous variable for age, where the reference category 0 included entrepreneurs aged up to and including 34 years, and category 1 included entrepreneurs aged 35 years or older. Males were used as the reference category for the gender variable.

The countries included in the study were divided into four geographical regions, as shown in Table 2. The region variable is categorical, with the reference category being the Latin America and Caribbean region. GEM also categorizes countries by their level of development into three groups, as displayed in Table 2. High-income countries serve as the reference category.

**Table 2.** Countries included in the survey, divided by region and income.

Regions	Countries
Latin America and the Caribbean (region_0)	Brazil (M), Chile (H), Colombia (M), Dominican Republic (M), Guatemala (M), Panama (M), Uruguay (H)
Asia (region_1)	India (L), Iran (L), Japan (H), Kazakhstan (M), South Korea (H), Turkey (M)
Middle East and Africa (region_2)	Egypt (L), Israel (H), Marocco (L), Oman (H), Qatar (H), Saudi Arabia (H), South Africa (M), Sudan (L), United Arab Emirates (H)
Europe and North America (region_3)	Belarus (M), Canada (H), Croatia (H), Cyprus (H), Finland (H), France (H), Germany (H), Greece (H), Hungary (H), Ireland (H), Italy (H), Latvia (H), Luxembourg (H), Netherlands (H), Norway (H), Poland (H), Romania (M), Russia (M), Slovakia (H), Slovenia (H), Spain (H), Sweden (H), Switzerland (H), United Kingdom (H), United States (H)

Income: H—high, M—medium, L—low.

We constructed the dependent variable from two variables, which were measured by agreement with the following statement: “When making decisions about the future of your business, you always consider social (environmental) implications?” Both variables are dichotomous, meaning entrepreneurs either agree or disagree with the statement. Since our study aims to compare entrepreneurs who consider social or environmental implications, or both simultaneously, we created a variable with four categories representing all possible combinations of the values of these two dichotomous variables. Entrepreneurs who never consider social or environmental implications when making decisions are the reference category.

### 3.2. Data Analysis

To test the formulated hypotheses, we employed multinomial logistic regression, which allows for the assessment of a categorical dependent variable. This enables us to formulate categorical variables that describe the pursuit of social, environmental, or both aspects of sustainability simultaneously, thereby achieving our research objectives. The IBM SPSS Statistics version 29.0 software program was used for analysis. In our study, we estimated the following function:

$$\hat{sd}g = \beta_0 + \beta_1 \cdot dig\_tech + \beta_2 \cdot gender + \beta_3 \cdot age + \beta_4 \cdot education + \beta_5 \cdot region_1 + \beta_6 \cdot region_2 + \beta_7 \cdot region_3 + \beta_8 \cdot medium\_income + \beta_9 \cdot low\_income \quad (1)$$

Multinomial logistic regression assesses the probability of an event occurring (i.e., the probability that the entrepreneur considers social or environmental implications or both) in relation to the reference event (i.e., the event in which the entrepreneur does not consider any of the listed implications). This is expressed in terms of an odds ratio, which represents the ratio of the probability of event  $j$  to the probability of the reference event  $k$  at a given value of the  $i$ -th explanatory variable. The natural logarithm of the odds represents the function of the estimated model 1 [121]:

$$\log \left[ \frac{\pi_j(x_i)}{\pi_k(x_i)} \right] = s\hat{d}g \quad (2)$$

From Equation (2), it follows that if the explanatory variable  $X_i$  increases by one unit (with the values of the other variables remaining constant), the natural logarithm of the odds ratio increases by the value of the regression coefficient for the changed explanatory variable if the corresponding regression coefficient is greater than zero. Consequently, this also means there will be an increase in the probability of an event occurring (entrepreneur considers social or environmental implications or both).

In research, when dealing with very large samples, such as the one in our study with 26,790 entrepreneurs, there can be an issue with a high number of statistically significant variables. This is due to the large sample size, which allows for the identification of statistically significant effects, but in practice, these effects might be negligible or unimportant. The reason for this phenomenon is that in large samples, the standard error becomes smaller, making more explanatory variables statistically significant [122]. To better understand which explanatory variables have a relevant impact on association with the dependent variable, we will use Cramer's  $V$  statistic, which explains the strength of the relationship between two categorical variables. It is calculated as follows:

$$V = \sqrt{\frac{\chi^2}{n \cdot (k - 1)}} \quad (3)$$

where  $\chi^2$  is the chi-square statistic for the analyzed variables,  $n$  is the number of units in the sample, and  $k$  is the number of categories of the variable with fewer categories [123]. The interpretation of Cramer's  $V$  values varies, so it is essential to assess the calculated values primarily relative to other Cramer's  $V$  values for variables in the estimated model. However, in our study, when interpreting Cramer's  $V$  values, we also relied on the criteria defined by Cohen [124] by establishing a scale for Cohen's omega and converting it into Cramer's  $V$ . This explanation relies on degrees of freedom, defined as the minimum number of categories from both variables minus 1. In our research, we used the degree of freedom thresholds, as shown in Table 3.

**Table 3.** The critical values of Cramer's  $V$  at the degrees of freedom for assessing the strength of the association.

df	Negligible	Small	Medium	Large
1	<0.10	<0.30	<0.50	>0.50
2	<0.07	<0.21	<0.35	>0.35
3	<0.06	<0.17	<0.29	>0.29

## 4. Results

### 4.1. Samples Characteristics

Table 4 shows that half of the entrepreneurs in our study intend to introduce digital technologies in sales. Male entrepreneurs dominate the sample, comprising 62.3%. Nearly one-third of entrepreneurs are under the age of 35, and roughly half of the entrepreneurs have completed secondary school or less. By far, the most entrepreneurs (46.5%) live in Europe or North America; other regions are represented between 10 and 25%. Consequently,

the majority (which is two-thirds) of entrepreneurs reside in high-income countries, while only 10% of them live in low-income countries. Likewise, approximately two-thirds of entrepreneurs consider both social and environmental implications when planning their business, followed by entrepreneurs who do not consider any of these aspects in their decisions. Entrepreneurs who solely contemplate either social or environmental implications make up around 9% for each category of implications.

**Table 4.** Descriptive statistics of the analyzed variables.

Digitalization	Intention to introduce digital technologies in sales	49.2%
Demographic factors	Men	59.4%
	Entrepreneurs under 35 years of age	35.6%
	Entrepreneurs with secondary school education or lower	55.7%
Regions	Entrepreneurs in Europe and North America	46.5%
	Entrepreneurs in the Middle East and Africa	18.2%
	Entrepreneurs in Asia	10.2%
	Entrepreneurs in Latin America and the Caribbean	25.1%
Country income	Entrepreneurs in low-income countries	10.8%
	Entrepreneurs in medium-income countries	20.3%
	Entrepreneurs in high-income countries	68.9%
Sustainable implications	No consideration of social or environmental implications in decisions	13.8%
	Consideration of social implications in decisions	8.7%
	Consideration of environmental implications in decisions	9.5%
	Consideration of social and environmental implications in decisions	68.0%

#### 4.2. Evaluation of Model Quality and Specification

To ensure the quality of the results, we verified the adequacy of the model specification using the chi-square test. Additionally, we checked for the presence of multicollinearity by calculating the variance inflation factor (VIF).

##### 4.2.1. Multicollinearity

Table 5 displays the VIF and Cramer's V values. The highest VIF value is 1.20, which is significantly below the threshold of five, indicating the absence of multicollinearity. Additionally, the Cramer's V between individual explanatory variables indicates that when using the threshold values from Table 3, the associations between the explanatory variables are weak. The exception is the association between the region and income variables, where Cramer's V is 0.51, suggesting a strong connection. This is expected because the development of countries around the world is not uniform but varies by region, resulting in countries in certain regions having higher incomes on average than those in other regions.

**Table 5.** Cramer's V between explanatory variables and VIF (bold in diagonal).

	(1)	(2)	(3)	(4)	(5)	(6)
Dig_tech (1)	<b>1.10</b>					
Gender (2)	0.00	<b>1.00</b>				
Age (3)	0.14 *	0.01	<b>1.04</b>			
Education (4)	0.04 *	0.02 *	0.03 *	<b>1.02</b>		
Regions (5)	0.29 *	0.08 *	0.19 *	0.15 *	<b>1.20</b>	
Income (6)	0.10 *	0.05 *	0.14 *	0.11 *	0.51 *	<b>1.12</b>

\*  $p < 0.001$ .

##### 4.2.2. Adequacy of Model Specifications

The adequacy of the estimated models' specification was tested with a chi-square test, which examines whether the predictive power (model fit to the data) of the estimated model is statistically significantly different from the fitted model without explanatory variables.

Therefore, the test assesses whether all regression coefficients are equal to zero [125]. The chi-squared value for our model is 2311.699 with 27 degrees of freedom, which means that our null hypothesis, which states that all regression coefficients are equal to zero, could be rejected with  $p < 0.001$ , indicating that the model is properly specified.

#### 4.3. Main Regression Result

Table 6 displays the results of multinomial logistic regression. The results indicate that companies planning to implement digitalization in sales are more likely to consider the social and environmental implications of their actions, or both. Interestingly, companies planning digitalization are most likely to consider both social and environmental implications, as the likelihood is 2.67 times higher for companies assessing their plans from both sustainability perspectives compared with companies which do not focus on sustainable aspects. In contrast, planning digitalization in sales leads to the lowest increase in the odds that a company will assess only environmental implications, as they only increase by 23%. These results allow us to confirm both hypothesis H1a and H1b.

**Table 6.** Results of multinomial logistic regression.

Variables	Social Implications		Environmental Implications		Both Implications	
	Coefficient	Odds Ratio	Coefficient	Odds Ratio	Coefficient	Odds Ratio
Intercept	0.33 ***		0.76 ***		2.61 ***	
Digital technologies	0.66 ***	1.93	0.21 ***	1.23	0.98 ***	2.67
Gender	−0.01	0.99	0.00	1.00	0.13 ***	1.13
Age	−0.32 ***	0.73	−0.04	0.97	−0.05	0.95
Education	0.04	1.04	−0.09 *	0.91	−0.16 ***	0.85
Europe and North America	−0.79 ***	0.46	−1.07 ***	0.34	−1.47 ***	0.23
Middle East and Africa	−1.04 ***	0.35	−1.62 ***	0.20	−1.46 ***	0.23
Asia	−1.08 ***	0.34	−1.19 ***	0.30	−1.86 ***	0.16
Low income	0.19 *	1.21	−0.26 **	0.77	0.17 *	1.19
Medium income	−0.45 ***	0.64	−0.46 ***	0.63	−0.59 ***	0.55

\*  $p < 0.10$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.001$

Gender does not influence the frequency of assessing the social or environmental implications of entrepreneurial plans, thus disproving hypothesis H2a and H2b. However, female entrepreneurs more frequently assess the implications of both sustainable aspects simultaneously.

Older entrepreneurs less frequently assess the social implications of their decisions compared to younger ones, as the odds for entrepreneurs over 34 years decrease by 27%. This leads us to reject hypothesis H3a. However, age does not affect the other two options, confirming hypothesis H3b.

Conversely, education's results differ from those of age. Education does not affect the likelihood that an entrepreneur will evaluate the social implications of their decisions, contrary to hypothesis H4a. However, higher education reduces the likelihood that an entrepreneur will assess the environmental implications and both social and environmental consequences of their decisions, refuting hypothesis H4b.

The regression results enable the confirmation of hypotheses H5a and H5b since, in all three regions, entrepreneurs less frequently assess social or environmental implications, as well as both simultaneously, compared to the Latin America and Caribbean region, which is the reference category. Differences between the reference region and the others are substantial. In the Europe and North America region, where entrepreneurs are most similar to the reference region, the probability is between 54% and 77% lower than in the reference region.

The results show that entrepreneurs in middle-income countries less frequently consider all three groups of implications we investigated compared to entrepreneurs in high-income countries (the reference category). The odds for middle-income countries are about 40% lower than the reference category. The same holds for the comparison with entrepreneurs in low-income countries regarding the assessment of the environmental implications of decisions, as the odds in these countries are 23% lower. However, entrepreneurs in low-income countries more often think about the social implications or both the social and environmental implications of their decisions compared to entrepreneurs from high-income countries. The odds ratio is about 20% higher in low-income countries. These results reject hypothesis H6a and confirm hypothesis H6b.

Due to the effect of the large sample size on the increased statistical significance of variables, we assessed the relevance of the impacts of explanatory variables using Cramer's V. The results in Table 7 show that most variables (gender, age, education, and country income) have a negligible relationship with whether entrepreneurs assess the implications of their decisions on sustainability aspects. There is a small association between the variables of digital technologies and the dependent variable, as well as the variable of regions. It is noteworthy that the association of digital technologies with the variable of sustainability is greater than the association with regions, indicating that among the numerous factors examined, digitalization planning has the most significant influence on incorporating sustainability aspects into business decision-making.

**Table 7.** The effect size of explanatory variables on the dependent variable.

Variables	Cramer's V	Size Effect
Digital technologies	0.21	small
Gender	0.03	negligible
Age	0.05	negligible
Education	0.04	negligible
Regions	0.12	small
Income	0.04	negligible

All Cramer's V are statistically significant at  $p < 0.001$ .

## 5. Discussion

The results of the multinomial logistic regression suggest that, of all the factors analyzed, planning to use digital technologies in sales has the most significant impact on the frequency with which entrepreneurs assess the sustainability impact of business decisions. This strongly supports the findings that digital and sustainable transformation can be integrated into a unified process, as digitalization enables sustainable business practices, in line with Zhou et al. [35]. More specifically, our findings are consistent with the conclusions of Malaquias et al. [79], Vrontis et al. [33], and Mondal et al. [126], who stated that digital technologies have a positive impact on corporate social responsibility and the achievement of societal goals. We also confirm the findings of Ha et al. [32], who stated that digitalization has a positive impact on the achievement of environmental goals.

However, our findings, which pertain to the general population of companies, differ from findings based on technological startups. The latter primarily pursue economic objectives and do not pursue the social and environmental aspects of sustainability [31]. This implies that digital technologies alone do not contribute to the holistic sustainable development of companies; rather, they just enable it, and how these technologies are used depends on the entrepreneur. Comparative results also suggest that companies whose core operations relate to digital technologies use them to achieve different goals than companies that use digital technologies as support for their main activities. Consequently, it is essential to emphasize that entrepreneurial orientation is crucial for achieving sustainable business, as it enhances the positive impact of digitization on sustainable operations [33]. Additionally, public policy, which needs to be digitally oriented, plays a significant role [127].

In reviewing the literature, we identified many positive and negative impacts of digitization on sustainable business. However, our research findings suggest that entrepreneurs consider the use of digital technologies to have more positive than negative impacts on sustainable business, as entrepreneurs who plan to use digital technologies are also more likely to consider the social and/or environmental implications of their decisions. Research suggests that digital technologies have the potential to improve current business practices for achieving sustainability goals, as well as creating new sustainable business practices.

Digitization enables the emergence of business practices that are sustainability-oriented and would not be viable without digitization. An example of this is the field of freight transport, where digitization improves efficiency and consequently reduces environmental impacts [128]. Digital platforms also facilitate the shortening of supply chains and direct connection between producers and consumers, ensuring a fairer income distribution. Online ordering systems enable the production of carpets by women in rural India [50] or the direct purchase of vegetables from farmers [129]. Online applications even allow people without arable land to remotely cultivate vegetables, where someone else carries out the work according to their orders [52]. Digitization also enables easier and more affordable access to education by establishing a digital educational system that connects children from poorer families with retired teachers [130]. Digitization has contributed to more efficient food distribution and poverty reduction in London [131]. Digital technologies also play a crucial role in more efficient plastic recycling [132] and more sustainable clothing production [133]. All these practical examples of the integration of digitalization and sustainability further confirm the interconnectedness between the two fields, in line with our finding that the impact of digitalization on sustainability is the strongest of all measured factors.

With regard to demographic factors, we observed very different results depending on the type of impact we looked at. We found differences between men and women in entrepreneurship only in the assessment of social and environmental impacts together, as female entrepreneurs consider these impacts more often than male entrepreneurs. Although previous findings on the relationship between gender and the achievement of sustainability goals are quite consistent, suggesting that women are more inclined to pursue sustainability regardless of the type of implications, our results only support those studies that recognize the positive influence of the female gender on the comprehensive achievement of sustainability [99,112,134], rather than individual groups of implications. Our research aligns with the findings of Bawakyillenuo & Agbelie [25] and Hechavarria et al. [29], as no discernible variations between genders were observed with regard to the pursuit of environmental goals. This is an intriguing finding, suggesting that entrepreneurs who pursue goals in both sustainability areas vary in their traits compared to those who focus on just one sustainability area. The previously mentioned studies point out that women are more inclined towards considering sustainability, and this is largely attributed to traditional gender roles [99,134]. However, our findings suggest that male entrepreneurs exhibit equal levels of sustainability orientation in comparison to female entrepreneurs in relation to one specific set of sustainability goals. This indicates that gender roles predominantly impact women, making them more inclined or competent in comprehending complex sustainability matters.

Our analysis reveals that age has a discernible impact on entrepreneurs' consideration of the social consequences of their actions, with younger entrepreneurs displaying a greater propensity to consider such effects. This finding contributes to the very limited research focusing solely on the social aspect of sustainability in relation to age. Our findings contradict the claims of Shahab et al. [100] that younger entrepreneurs primarily prioritize profitability over altruistic goals. The results can be explained by younger entrepreneurs' greater innovation and proactivity [101,135], which enable them to simultaneously address entrepreneurial issues related to financial performance and societal value creation. However, this prompts the question of why this mechanism is not effective for the other aspects under examination. The frequency of evaluating environmental or combined implications is not affected by the entrepreneur's age, as confirmed by the findings of Hörisch et al. [26]

and Nicolás et al. [97]. These results prompt new research questions and offer opportunities for further studies.

In contrast to age, education is a statistically significant variable for both environmental and combined implications. It is interesting to note that higher education decreases the likelihood of entrepreneurs assessing these implications, which is a unique finding compared to previous research. Additionally, it is worth mentioning that this impact is only marginally significant for environmental consequences and highly statistically significant for assessing both consequences simultaneously. This implies that entrepreneurs with higher education levels tend to neglect the sustainability implications of their actions. Considering that financially successful entrepreneurs are frequently highly educated [136–138], we may conclude that individuals with advanced education prioritize the profitability of their businesses whilst placing less weight on the other two aspects of sustainability. However, it is important to stress that the impact of education and the other two demographic factors on the frequency of entrepreneur's consideration of sustainability implications is negligible.

The results about the regions are consistent with our prediction that entrepreneurs are most likely to consider the social and environmental implications of their choices in Latin America and the Caribbean. On average, this region has the highest number of entrepreneurs pursuing an altruistic motive, and it has made the most advancement towards achieving the SDGs. Entrepreneurs in other regions are significantly less likely to consider the sustainability implications of their decisions based on the odds ratios. The difference between Latin America and the Caribbean and the rest of the regions is greatest for entrepreneurs who consider both social and environmental implications simultaneously. It is evident that Europe and North America differ somewhat from the other two comparable regions, as the disparity with Latin America and the Caribbean is less pronounced.

To explore why Latin America and the Caribbean differ so significantly from the other regions, one should consider why this area has a significantly greater proportion of entrepreneurs motivated by altruism in their business practices. This is less likely to be related to the rapid progress of this region in achieving the SDGs, as this achievement also depends on government decisions and the achievement of the economic aspect of sustainability, which is also relevant for this region. Latin American and Caribbean nations experience several social and environmental challenges. Hunger persists in these countries, with a rise seen in the Caribbean and a decrease in Latin America. Education access is limited, leading to high income inequality, which otherwise has decreased. Up to 50% of individuals in this region engage in informal employment, and this percentage is not declining. The region also contends with a significant refugee population and elevated levels of violence and homicide. Moreover, deforestation and land degradation are salient concerns in this area [118,139]. Considering all of the aforementioned factors, it is expected that individuals will regularly encounter both social and environmental challenges, providing an impetus for them to engage in sustainable entrepreneurship [106,140]. The situation in Africa is analogous, leading us to anticipate that the African region would be comparable to Latin America and the Caribbean in our findings, but this is not reflected in the results. The probable reason for this lies in the fact that African countries are integrated into the Middle East and Africa region, comprising wealthy countries of the Middle East that differ markedly from African nations. Similarly, less affluent African nations, which are facing with more prominent social and environmental challenges, are not comprised within the GEM.

Entrepreneurs from middle-income countries are less likely to evaluate their decisions from multiple sustainability perspectives in contrast to their counterparts from high-income countries. However, comparing entrepreneurs in low-income countries is not a straightforward task, as the findings imply that entrepreneurs in low-income countries are more inclined to incorporate the social implications and social and environmental implications while making decisions, but not the environmental implications alone. Such results completely contradict Hechavarría's [115] study, as they show that societies that are survival-

oriented are also more vulnerable to social problems. The findings of Marín et al. [99] are rejected here, as our results indicate that sustainable business cannot be generalized as a unitary process. Rather, individual aspects of sustainability must be studied.

The interpretation of the results on the importance of countries' incomes is probably the same as for regions, i.e., that an important factor for sustainable business is experience [106,140]. Specifically, social issues in low-income countries are pronounced, and therefore entrepreneurs operating in low-income countries are more inclined to prioritize the social outcomes of their decisions as compared to those operating in developed countries. Meanwhile, environmental issues are less linked to a specific country's income and have become a global concern, presenting more opportunities for entrepreneurs in high-income nations. Individuals in such countries often have higher wages and the freedom to invest their time in less lucrative ventures, such as environmental projects. In developed countries, opportunity motivates more entrepreneurs, rather than necessity [113]. In middle-income countries, social issues like hunger and poverty are less severe than in low-income countries. As a result, entrepreneurs in these countries are less concerned about these issues. However, the incomes of these entrepreneurs are not particularly high, which means they are less likely to focus on less existentially important topics such as environmental sustainability [115]. Entrepreneurs in middle-income nations are the least inclined to consider the social and environmental impacts of their decisions.

The integration of systems thinking into the analysis of sustainable business practices and the role of digital technologies reveals considerable insights in our discussion. This approach highlights the complex, multi-layered nature of entrepreneurial ecosystems, where each element—be it technological innovation, policy, or sustainability practice—is not merely an independent unit but a part of a larger, dynamic system. The findings of this study suggest that the successful implementation of sustainable practices in the digital age requires a systemic understanding of these interrelations. For instance, technological advancements can both drive and be driven by sustainability goals, but this synergy can only be fully leveraged through a systemic approach that considers all stakeholders and environmental impacts.

Furthermore, the discussion around systems thinking in the context of this research underscores the need for adaptive strategies in entrepreneurial education and policymaking. The ever-evolving digital landscape demands a continual reassessment of strategies and practices, a process well suited to the fluid, holistic nature of systems thinking. This study reinforces the argument for an educational paradigm and policy framework that embraces the complexity and interconnectedness inherent in contemporary entrepreneurship. By fostering a systems mindset, stakeholders across the entrepreneurial spectrum can more effectively navigate and capitalize on the challenges and opportunities presented by the digital transformation and its intersection with sustainable business practices.

## 6. Conclusions

In our investigation, we analyzed the factors that affect entrepreneurs' decisions to consider social or environmental consequences, or both, while making business decisions. Out of the four groups of factors, we discovered that digital technology adoption for sales and the geographic location of the entrepreneur have significant and relevant influences. While demographic factors and a country's income level have statistically significant effects, the Cramer's V statistic indicated that their influence on the dependent variable is not substantially large.

Our findings emphasize that the level of digitalization in sales is the most significant factor among the studied variables. This study supports the notion that implementing digital technology in business can have a positive impact on sustainability practices, regardless of the specific sustainability aspect a company pursues. Additionally, the results of our research also suggest that the entrepreneur's past experience of social and environmental problems could be important for sustainable entrepreneurship, since entrepreneurs most

often evaluate their decisions from the perspective of sustainability in the Latin America and Caribbean region, which is heavily burdened with social and environmental problems.

However, it is important to note that the study has several limitations. Specifically, the digitalization variable only measures the intended adoption of digital technologies in sales, solely focusing on digitalization in the sales aspect without considering the broader context. Moreover, the study fails to evaluate the actual levels of digitalization within companies, which may differ from the initial plans. Some regions under investigation may not be entirely representative, as the Asian region mostly consists of high-income countries. Additionally, the grouping of Africa and the Middle East combines countries that differ significantly from one another. Furthermore, central African countries are also not represented in this region. The study is also cross-sectional, as more reliable results could be obtained with a longitudinal study.

The study confirms the importance of systems thinking in understanding and navigating the complex interplay between digital technologies and sustainable business practices in enterprises. The analysis highlights the necessity for integrated strategies that consider the multifaceted and dynamic nature of these business systems. The literature emphasizes the significance of supporting a systems mindset among entrepreneurs, policymakers, and educators to effectively adapt to and shape the evolving landscape of digital transformation and sustainability. This study contributes to a deeper understanding of the systemic challenges and opportunities in entrepreneurship, paving the way for more resilient, sustainable, and innovative business practices in the digital age.

Our study is one of the first to investigate disparities in influential factors among diverse sustainability dimensions in entrepreneurship. Our results have demonstrated that distinct factors can have varied effects on the frequency of pursuing social, environmental, and combined sustainability aspects. Furthermore, we provide a significant contribution to the scant literature on the notion of digitainability. The study suggests that a country's level of development does not significantly influence entrepreneurs' sustainability orientation. Rather, geographic locations are the primary factor, which has not been thoroughly researched. Furthermore, our findings imply that despite extensive studies, demographic factors' significance in guiding entrepreneurship towards sustainability remains unclear.

Therefore, in further research, it would be necessary to focus in more detail on the investigation of factors that influence the very diverse identified impacts of demographic factors on sustainable business, which our research, by separating the social, environmental, and combined aspects, only further confirms. Additionally, further research is needed to examine the role of digitalization in sustainable business, considering various perspectives such as different digital technologies, modes of implementation, and the business area of digitization. Since our research is based on a global sample, encompassing highly diverse countries, its primary task is to provide a general insight into the field of digital and sustainable transformation, laying the groundwork for further research that can focus on investigating digitainability in individual regions and countries. Additionally, our results offer a basis for further exploring the reasons for differences that arise between regions, income groups of countries, and demographic factors, which we could not delve into more deeply due to our research approach.

As a result, because our study is more focused on a general understanding of the connection between digital and sustainable transformation, as described in the previous paragraph, it does not offer numerous practical implications. Despite this, the survey results demonstrate to entrepreneurs that digitalization can facilitate sustainable business transformation, aiming to encourage entrepreneurs to adopt more extensive digitalization of business processes. This information is also valuable for governments, as they can promote digitalization among entrepreneurs to achieve sustainable development and advance the SDGs. Our results indicate which geographic regions, income groups of countries, and demographic factors are linked to less frequent assessments of business decisions about individual sustainability aspects, allowing countries to implement more focused measures to achieve desired changes in business sustainability. At the same time, our results, due

to the separate treatment of various sustainable aspects, also enable the differentiation of measures that promote social or environmental sustainability goals. However, more focused research is needed for a better understanding of the specificities of individual countries.

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