Article

Approach to the Impact of Digital Technologies on Sustainability Reporting through Structural Equation Modeling and Artificial Neural Networks

Anca Mehedintu *[ID] and Georgeta Soava [ID]

Department of Statistics and Economic Informatics, University of Craiova, A.I. Cuza 13, 200585 Craiova, Romania; georgeta.soava@edu.ucv.ro
* Correspondence: anca.mehedintu@edu.ucv.ro; Tel.: +40-251-411317

Abstract: The motivation for study derives from the requirements imposed by the European Union Corporate Sustainability Reporting Directive, which increases the sustainability reporting scope and the need for companies to use emerging digital technologies. The research aim is to evaluate the digital transformation impact of the European Union companies on sustainability reporting expressed through three sustainable performance indicators (economic, social, and ecological) based on a conceptual model. The data were collected from Eurostat for 2011–2021. The study proposes a framework for sustainable performance analysis through linear regression models and structural equations. Additionally, a hierarchy of digitization indicators is created by modeling structural equations, depending on their impact on sustainability performance indicators, which is validated using neural networks. The results indicate that the company's digital transformation indicators positively influence economic and social performance and lead to an improved environmental protection (a decrease in pollution), proving the established hypotheses' validity. The proposed model can be the basis for companies to create their dashboards for analyzing and monitoring sustainable performance. This research can be the basis of other studies, having a significant role in establishing economic and environmental strategies to stimulate an increase of companies that carry out sustainability reporting.

Keywords: sustainability reporting; digital transformation; modeling structural equations; artificial neural networks; European Union; digital technologies; cloud computing

1. Introduction

The COVID-19 crisis has emphasized the need for a response that brings long-term benefits to European society and competitiveness, with sustainability becoming an increasingly important dimension for companies and society. Consequently, companies are pushed to implement sustainability-oriented practices and report on financial and social performance and environmental aspects.

After 2015, at the European Union (EU) level, a higher emphasis was placed on non-financial (sustainable) reporting [1]. Given that climate change is increasingly visible and the impact of the COVID-19 crisis on companies was powerful, a new directive of the European Union, the Corporate Sustainability Reporting Directive (CSRD) [2], established that companies should publish more information related to sustainability, with a particular emphasis on the connectivity between financial and sustainability statements. Thus, companies must make significant changes in the reporting way due to the impact of their activities on the environment and society. In achieving these objectives, companies rely on modern technologies that increase their transparency and also identify risks and opportunities for long-term business development. Thus, by the digital compass for 2030 [3], the EU establishes the companies to benefit from and use the latest digital technologies to ensure Europe's recovery and regain a competitive position in the global economy.

Technology and digital infrastructure have further highlighted their need in business environments with the COVID-19 pandemic to communicate, work, and respond to current environmental issues. Along with the digitalization of companies, the strong positive impact of the digitalization of financial-accounting reporting systems on the quality of information was demonstrated [4–8]. The COVID-19 pandemic required the rapid reorganization and digitization of all management and decision-making processes, with financial-accounting reporting occupying, in this approach, a central place [9,10].

Digitalization creates opportunities to exploit information more efficiently and enables the centralization of data at the EU and countries' member levels in an open and accessible format that facilitates knowledge and comparison of data. In this context, the digital transformation of economic entities and usage tools specific to Industry 4.0. outlines a new vision for the reporting environment [11].

Following the research of the specialized literature regarding the role of digitization in the activity of sustainable reporting both at the company level and at the country or regional level, we found that such information is missing. Consequently, the paper's purpose is to evaluate the extent to which digitalization influences the sustainable reporting process of European Union companies. The motivation for carrying out this study derives from the requirements imposed by the EU [2], which increase the scope of sustainability reporting, thus highlighting the need of companies to use emerging digital technologies for reporting efficiency.

This research proposes a conceptual model, created on the example of the EU, to evaluate the impact of digitization (through a series of digital technology indicators) on sustainable reporting expressed through three categories of sustainability performance indicators (economic, social, and ecological). Each category indicator was established based on the existence of information; it was collected for the EU for 2011–2021. The study is a subject of great interest both from a scientific and political point of view to take effective and sustainable economic policy measures both at the EU level and at the level of each member country for the integration of digital technologies to companies for effective sustainability reporting.

The study is structured in two parts. In the first part, the existence of causal relationships between the indicators of sustainable performance and those of digitalization proposed in the model is investigated and the significance of these relationships is estimated through linear regression models and structural equation models (SEM). The second part makes a hierarchy of digitalization indicators according to their impact on sustainability reporting indicators by structural equation modeling (SEM). The obtained results are validated using neural networks (ANN). The research novelty consists of a conceptual model created by the authors for evaluating the relationship between sustainable reporting and digitalization and using an SEM-ANN model for the digitalization indicators ranking on sustainable reporting, according to their impact.

The results indicate that digital transformation indicators of companies positively influence economic and social performance. At the same time, the implementation of digitization leads to an increase in the protection of the environment, respectively, a decrease in pollution. The model proposed in the paper can become a framework for creating dashboards at the macro or microeconomic level with indicators that are the basis of sustainability reporting. In conclusion, it is clear that in an interconnected world, EU states need to implement the latest digital technologies at the level of their entities to enable citizens and companies to take advantage of the potential of digital transformation and contribute to creating a healthier, more prosperous, and more ecological society.

The article is structured in five sections. After the introduction and the specialized literature review in the third section, the conceptual model indicators and the research methodology are presented. Next, the research findings and discussions based on them are presented in Section 4. Finally, Section 5 concludes the study findings and outlines the research limitations and directions for future research.

2. Theoretical Background and Development of Hypotheses

2.1. The Digitization Role in Sustainability Reporting

The significant importance given to ensuring a sustainable environment led to a global initiative accomplishment, "Transforming our world: The 2030 Agenda for Sustainable Development" [12], whose objectives had in mind the three dimensions of sustainable development: economic, social, and environmental. The objective achievement is based on the joint action of all society entities, especially companies, through the implementation of sustainable strategies [13].

Through sustainability reporting, companies are more transparent about the risks and opportunities they face. Thus, companies involved in sustainability reporting must determine what information and indicators they report and how to communicate them [14].

A general framework for the company's sustainability reporting was made [15], which includes reliable and valid universal measurement standards of environmental, social, and governance variables, thus increasing transparency on their contribution to society's durable development variables. At the European level, a published sustainability report measures how well companies integrate these elements into their practices. These are effective means of allowing companies to respond in a single document to a wide variety of issues raised by stakeholders (for example, investors). At the same time, the EU reporting standards impose a digital taxonomy on sustainability to allow the rigorous collection of information on environmental factors (climate change, pollution, water and marine sources, resources, and circular economy, biodiversity, and ecosystems), social factors (own workforce, workers in the value chain, affected communities, consumers, and end users), and governance factors (governance, risk management, and internal control, business conduct) [2].

The crisis caused by the COVID-19 pandemic has had a significant impact on the extent to which companies have taken steps toward digital transformation to easily manage the threats and opportunities in their transformation [16].

Analyzing the relationship between digitalization and sustainability reporting is particularly important because understanding digitalization and sustainability determines how different actors (including managers and policymakers) act [17]. Some studies find that digitalization has a significant impact on ecological and economic sustainability and a less significant effect on social sustainability [18].

At the EU level, the digital transformation of businesses is one of the main pillars of the digital compass, and by 2030, 75% of companies will have to use emergent technologies (cloud computing, big data, and artificial intelligence services) [3]. In this way, by building and deploying the technological capabilities that allow companies to take advantage of the potential of digital transformation, the EU will contribute to sustainable society creation.

The Fourth Industrial Revolution (Industry 4.0) is the basis for implementing business model innovation strategies and transformation by ensuring sustainable business performance [19]. Industry 4.0 technologies have guided the companies reporting to achieve sustainable reporting [20,21] and the era of Industry 5.0. will continue to excel in the perspective of digital sustainability reporting [22]. The use of Industry 4.0 and 5.0 for the digitalization of companies involves the use of emergent technologies (artificial intelligence, blockchain, intelligent data analysis and cyber security, cloud computing, big data, Internet of Things, Internet of Everything, and augmented reality) that contribute to the remodeling of companies' businesses [23]. At the same time, modern technologies offer real-time connectivity to company-specific processes and information, facilitating the decision-making process and contributing to the efficiency of employees' work [24].

The digitalization process requires, in addition to a well-organized implementation plan, a specialization of the human factor, which changes the role of professionals. It is found that the digitalization of financial-accounting activity is not only a modern solution imposed by technological progress, but it is necessary and timely to anticipate the uncertain economic and social context [25,26].

In the EU, the need for the fastest possible integration of modern technologies at the level of companies has required states to invest in digital infrastructure to stimulate Europe's competitiveness and green transition [27].

The need to achieve sustainability reporting at the company and institutional level to ensure sustainable development at the regional level [28] has required paying more attention to the reporting area of companies [21,29], highlighting the opportunities and benefits of integrating social and environmental components in financial accounting, in order to provide the information needed to increase investment [30].

2.2. Conectivity

The main characteristic of digitization and globalization is digital connectivity, linking companies across the world despite extreme uncertainties and disruptions. Global connectivity connects nations, industries, companies, and individuals around the world through flows of data, information, ideas, and knowledge, and through flows of goods, services, investment, and capital that are digitally enabled and supported [31,32].

The increased demand for the integration of information and communication technologies at the level of companies' activity shows a tendency to automate and achieve the exchange of information through new technologies (artificial intelligence, the Internet of Things, software robots, and cyber security) [33,34]. The dominant business models carried out on the Internet have the connectivity-content-context-commerce typology [35]. Thus, connectivity plays a fundamental role by introducing telecommunications in the I4.0 context, ensuring secure data exchange and transparent communication [36]. Good connectivity can be achieved by implementing advanced technologies (the fifth generation of mobile networks—5G) that meet the requirements for high-traffic volume real-time communications [37].

The new connectivity in digital form is an essential characteristic for companies to face the uncertainties in the modern world (pandemics, crises), to lead to organizational resilience improvement and to protect the environment [38]. The COVID-19 pandemic has made a possible radical shift to digital connectivity. Rapidly, companies have intensified their use of digital technologies, and digital business models and virtualized businesses have proven to be scalable and have a great contribution to reducing pollution [31]. At the same time, the implications of the digital divide [39], both on the capacities of small and medium-sized companies (SMEs) to operate in difficult economic times and the gap between levels of digital connectivity were evident [40]. Investments in infrastructure have led to improved digital connectivity providing a range of opportunities for access to broadband and high-speed services, which have narrowed the digital divide [41,42].

Most studies so far have interpreted digital connectivity in terms of connectivity technologies (ICT, cloud services, IoT, AI, and data analytics) that really serve as the foundation for connection with corporate members and the business community. However, digital connectivity goes beyond the usability of these technologies and encourages innovation, increasing efficiency through new business model use, simplified processes, intelligent decision-making, and adding value through customer experience [38,43]. It is obvious that a company that has greater connectivity can more easily enter new markets, encourages creativity, and offers a high capacity for reaction and adaptability in the organization of activities [44].

Based on the specialized literature that analyzed the factors that make connectivity the fundamental element for carrying out the activities of companies in the digital age, to determine the role in sustainable reporting, we formulated the following hypothesis:

Hypothesis 1 (H1). *Connectivity (CO) has a significant favorable influence on economic (EP) and social performance (SP) and an indirect influential on environmental indicators (NP).*

2.3. Websites and Use of Social Media

The progress made by information and communication technologies has made companies invest more and more in digitalization, from simple websites to the integration of technology in all sectors of a business [45]. Through the Internet, by implementing websites, companies can make their brand known, support online and offline business promotion, generate contests and promote events, make direct sales, and discover community members interested in their products and services [46,47]. Stakeholder communication on websites is of better quality for larger companies due to their more significant resources [48,49]. Websites, social networks, and electronic commerce have a significant contribution to marketing activity, making the activity of companies more efficient [50–53]. Marketers must carefully coordinate the use of different digital tools to ensure that they reach their target market in an adequate manner [54]. Companies use social media to promote their products, services, and brands, build a brand image, and manage customer relationships [55]. Advances in Web 2.0 technologies and growing applications of social networks have revolutionized business models and operations, leading them to sustainable development and environmental protection [56–59]. The current trend is for companies to see social networks as an optimal way to improve lasting and valuable relationships with other companies [60]. Discrepancies between business sectors in online activity and engagement trends suggest a low social media presence of SME activity [61].

The analysis of the factors that make the use of the Web and social networks a compelling experience for companies in the process of collecting information for the achievement of sustainable reporting led to the formulation of the following hypothesis:

Hypothesis 2 (H2). *Websites and the use of social media (WS) have a significant favorable influence on economic (EP) and social (SP) performance and a significant inverse influence on environmental performance (NP).*

2.4. Information Management

Sustainability reporting promotes transparency. This imposes the need for quality information collection to measure corporate sustainability progress [62]. Thus, an information system implementation based on modern technologies has a positive and significant effect on the quality of reporting [9,63,64].

The digital transformation in reporting activity (blockchain, big data), supported by cloud-based analytical tools and artificial intelligence, brings new challenges and opportunities to finance and accounting services [65,66], automating the decision-making process on a large scale [67,68].

Industry 4.0 offers enormous potential to the field of reporting, a series of routine tasks can be automated, and people are being replaced by robots. Thus, people allocate more time to enriching their creativity and bringing added value to companies [66,69].

The impact of information technology on the financial-accounting reporting system improves the quality and performance of reporting transparently and securely; the integrity and quality of reporting information is a challenge that comes with technological evolution [70].

At the level of companies, the most used technical tool that manages and facilitates the flow of information is Enterprise Resource Planning (ERP) because it provides accurate and timely information for decision-makers [38], allowing companies to make effective strategic decisions and increase productivity [71,72]. The dynamic development of technology and changing needs of companies have resulted in the evolution of ERP systems [73], and the expansion of some ERP capabilities to bring more value to the company [74] and greater user satisfaction [75,76].

The incorporation of blockchain technology (BT) into ERP systems is the next generation in business technology, which will transform business operations and the functionality of companies in a new and modern way, enabling real data interoperability for various commercial and banking services (online payments, trade, contract management facilities,

finance, and accounting) [77]. At the same time, BT integration with ERP can considerably improve the business process productivity, speed, flexibility, and quality [78,79].

Digitalization is transforming the work of tax administrators and increasing their ability to collect, process, and monitor tax information. Thus, electronic invoicing (e-invoicing) allows the automatic transfer of invoicing information between companies and the tax authority, better integration of invoicing and payment systems, improved accuracy and security of information, and easier access to collection operations/payments, replacing cumbersome paper processes [80,81].

The COVID-19 pandemic had a massive negative impact on marketing processes [82]. Thus, to facilitate interactions with customers, along with ERP, companies had to implement customer relationship management (CRM) applications [83], which, apart from their promotion role, also constitute a strategic social responsibility initiative [84].

CRM is efficient for a favorable brand image and attitude by increasing purchase intention, increasing sales [67], achieving higher profits, and adding shareholder value [85]. With CRM implementation, the company considers factors that can reduce skepticism and increase customer satisfaction [86,87], improving the company–customer relationship [88,89] and helping the company to respond and adapt its activity according to customer requirements [36,90].

Taking into account the research findings regarding the importance of IT systems in sustainable reporting, the following hypothesis is formulated:

Hypothesis 3 (H3). *Information management (IM) has a positive and significant impact on economic (EP) and social (SP) indicators and an indirect influence on environmental indicators (NP).*

2.5. Electronic Commerce

The COVID-19 pandemic has forced an increase in the popularity of e-commerce in all EU member states due to the need to carry out transactions and interactions at a distance. At the same time, the pandemic had damaging effects on many companies, but those with strong e-commerce channels maintained their activity during the crisis and at least compensated for some of the losses from physical sales points [91].

The acceleration of digital transformation has given companies agility in making decisions; electronic commerce has become a condition for business development and establishing optimal relationships with customers [92], innovative marketing strategies adopted, and new business models [93,94]. At the company level, e-commerce optimizes the supply chain, automates internal processes, and provides real-time information on inventory, production, sales, and distribution, bringing added value to products and services [95], resulting in financial gains and access to a wide range of markets, and also provides improved customer service [96].

The studies carried out on customer satisfaction regarding the use of electronic commerce during the pandemic have shown that if they are satisfied, they will continue to use this type of commerce in the long term, which will produce a significant transformation from a technological, social, and economic point of view [97].

Electronic commerce implementation is essential for the adaptation of companies to the digital era to increase sustainable performance, which is why we formulated the following hypothesis:

Hypothesis 4 (H4). *Electronic commerce (EC) positively and significantly influences economic performance (EP) and social performance (SP) and has a significant inverse influence on environmental performance (NP).*

2.6. E-Government

The COVID-19 pandemic has forced a rapid change in how companies interact with each other and with state institutions, with social media sites becoming the main tool to face these challenges [98].

In moving to e-government, states had to consider several factors to overcome the difficulties of infrastructure, and cultural, political, technical, and social aspects [99]. However, adequate infrastructure provision alone is not sufficient to ensure the success of e-government [100]. An increase in the quality of information [101] and cyber security is needed so that companies stimulate the acceptance and use of e-government services [102]. At the same time, by knowing the companies' perceptions of the use of electronic services, it will be possible to increase their quality through total digitization, alignment with the companies' requirements, and periodic data updating [103].

The study of the link between e-government and sustainable performance for European states demonstrated the positive impact of e-government [104].

Following the literature research, the following hypothesis emerges for investigating the effect of governance services on sustainable reporting:

Hypothesis 5 (H5). *E-Government (EG) has a significant positive impact on economic (EP) and social (SP) indicators, and on environmental indicators, it exerts an influence in the opposite direction but is significant (NP).*

2.7. Other Uses of ICTs

Digital transformation in the reporting activity is supported by analytical tools based on cloud technology [68] which have contributed to sustainable business performance improvement. The adoption of cloud technology by companies [105] allows access to financial-accounting data from anywhere, which will be able to track and streamline processes in real time, with beneficial effects on communication with all actors involved [106].

Cloud computing allows companies to manage large volumes of data without their own data center and manage business information in an integrated way, which leads to end-user satisfaction, and increased information quality and interaction between information technology and managerial decisions [107].

With cloud computing technology, companies can increase their operational efficiency by implementing systemic risk assessments and creating effective policies and risk response plans [108]. At the same time, cloud technology is an element of technological progress in the relationship with state administrations (through electronic invoicing) [67].

Blockchain (access to distributed ledgers) and big data technologies supported by cloud-based analytics tools can significantly improve financial visibility and enable more prompt intervention [109]. Blockchain is used to ensure financial security and cyber security in financial accounting through ledger technology use and as a tracking system for financial irregularities [110].

Based on these findings, the following hypothesis is issued:

Hypothesis 6 (H6). *Modern information technology (IT) significantly positively influences economic (EP) and social (SP) performance and negatively influences the environmental performance (NP).*

2.8. ICT Skills

The use of cloud technology allows openness to remote work for employees and customers, which is a significant advantage for companies [106]. Moreover, digitalization will contribute to a reorganization of social contact between people and the business environment, with significant differences between professionals educated in the analog era and those born in the digital era. This requires continuous education and specialization in using emerging technologies [5]. For the companies' digitalization to bring benefits, it is necessary to have professionals behind the new technologies used, that can advise entrepreneurs along the way of implementation practices [111].

Remote work for employees and customers requires the adoption of measures involving implementation policies for their development and structuring, and staff training is very significant [108]. Using intelligent applications, employees will become more efficient,

and they can have the opportunity to serve more clients to whom they can provide real-time reports [67,112]. Thus, companies want employees who know how to use new technologies (artificial intelligence, the Internet of Things, blockchain, etc.) to integrate them as quickly as possible into their activities [68].

Research demonstrates that digital intelligence and organizational support are coupled in a company's ability to carry out its activities in a flexible mode, be open to implementing new ideas, and protect the environment [39,113].

Based on researched studies on the need for continuous qualification of ICT employees and the need for companies to hire professionals to increase sustainable performance, we formulated the following hypothesis:

Hypothesis 7 (H7). *Hiring staff with ICT skills (IS) positively influences economic (EP) and social (SP) performance and negatively influences the environmental indicators (NP).*

2.9. Sustainable Performance Indicators

Following the COVID-19 pandemic, it was found that the role of companies is crucial in the event of disruptive events (crises, pandemics), and the pursuit of profit growth for shareholders is no longer the sole objective of business, but sustainability performance (environmental, social, and governance) [114]. In this context, the corporate reporting activities' primary role should be oriented towards highlighting the role of companies in achieving sustainable growth in the medium and long term [115].

The introduction of modern technologies in the reporting process helps achieve sustainable development goals [116,117] by the accounting of economic, environmental, and social factors to protect business assets and society's interests [118].

Adoption of digital technologies can significantly contribute to a firm's short- and long-term competitive advantages [119], and creating a comprehensive reporting model presents a real challenge for companies [120]. At the same time, technology plays a decisive role in the entrepreneurial process, especially for small and poor firms in maintaining themselves in a particularly dynamic global market [121].

Accountability information should be highlighted in the reporting process so that stakeholders can accurately manage the risks associated with their investments in the firm's financial and non-financial resources [122]. Thus, there must exist a convergence between sustainability reporting standards to provide relevant, comparable, and reliable financial and non-financial information [123].

Prosperous economic and financial performance is crucial for sustainable company growth and survival in the long term, so companies must link the relevance of sustainability reporting to company performance [124].

A series of studies analyzed the impact of economic–financial performance indicators on the sustainable development of companies [125], demonstrating that digitalization has had a significantly influence [126]. At the same time, the increase in the performance of companies is also determined by the quality of the labor force, and a specialized labor force causes an increase in personnel costs, but this does not necessarily mean lower profitability [127].

Companies enter into a series of interactions with the environment and society [128], thus having to carry out a series of sustainability actions and reporting these actions and their results [129,130]. Thus, companies have broadened their perspective on accounting and social responsibility regarding the impact of companies on sustainability, linking sustainability with accounting [17,131].

Sustainability reporting acts as a corporate accountability tool by highlighting a company's performance on climate change and human rights issues [132].

Digitalization and ecological performance, as well as the transformations it imposes on the business environment and, implicitly, on organizational results, will contribute to the efficiency of technological processes to increase the speed of information transmission and the development of processing [133].

The need for sustainable development at the global level makes companies modernize their businesses to protect the environment and reduce gas emissions to reduce pollution. At the same time, due to the increased interest of investors in ensuring social and environmental protection, companies must review their sustainability reporting mechanisms [134,135].

The environmental performance assessment allows an assessment of environmental risks, the approach of solutions to reduce the impact on the environment, and the development of long-term company activity development plans [136].

To identify the effects of environmental strategies on the company's performance, some studies have analyzed gas emissions (GHG) as an environmental performance indicator that effectively measures the company's efforts in mitigating the impacts related to its processes and products [137].

Analysis of the relationship between firms' financial performance and environmental performance [138–140] shows that there is a great emphasis on the ability of companies to self-adjust their environmental performance, with investors pressing to be compensated for policy risks related to climate change, as without evidence of improved financial performance achieving environmental goals could be perceived as costly and economically inefficient [141–143].

3. Data, Models, and Methodology

3.1. Data Collection

For the research, a series of macroeconomic indicators at the EU level were used, which manage to quantify the indicators of digital transformation and those of sustainable reporting, taken from the Eurostat Database for the period 2011–2021 [144]. The data series were extracted through SDMX-SOAP (Statistical Data and Metadata Exchange-Simple Object Access Protocol) web services, using a series of queries to retrieve data according to specific criteria and transfer them to the data processing software systems used.

The connectivity quantification (CO) considered the connectivity and remote access of businesses and workers, and used as indicators:

- Enterprises with (fixed/mobile) broadband, expressed as a percentage of total enterprises—CO1;
- Persons employed with access to the internet for business purposes, expressed as a percentage of total employment—CO2;
- Persons employed, which were provided a portable device that allows a mobile connection to the internet for business use, expressed as a percentage of total employment—CO3.

To quantify the management of websites and the use of social networks (WS) by companies, the following variables were taken into account:

- Enterprises having a website, expressed as a percentage of total enterprises)—WS1;
- Use of social media: social networks, blogs, file sharing, and wikis, expressed as a percentage of total enterprises—WS2.

To identify the role of the main information management tools (IM) (ERP, CRM, electronic invoicing) in the companies' activities, the following indicators were used:

- Enterprises using ERP software, expressed as a percentage of total enterprises—IM1;
- Enterprises using CRM software, expressed as a percentage of total enterprises—IM2;
- Enterprises receiving e-invoices, expressed as a percentage of total invoices and enterprises—IM3;
- Enterprises sending e-invoices, expressed as a percentage of total invoices and enterprises—IM4.

The quantification of the role and relevance of electronic commerce (EC) at the company level was achieved through the following indicators:

- Enterprises with web sales (via websites, apps, or marketplaces), expressed as a percentage of total enterprises—EC1;

- Enterprises with web sales—B2B and B2G, expressed as a percentage of total enterprises—EC2;
- Enterprises with web sales—B2C, expressed as a percentage of total enterprises—EC3.

As an indicator of the use of ICT tools by companies in their interaction with public authorities (EG), the following was chosen:

- Use of the internet to interact with public authorities expressed as a percentage of total enterprises—EG1.

More indicators show the use of information technology (IT) at the level of companies (cloud computing, big data, artificial intelligence, the Internet of Things), but unfortunately there was not reported information about their use until 2021. The only indicator which has information reported is the use of cloud technology expressed by:

- Buying cloud computing services used over the internet, expressed as a percentage of total enterprises—IT1.

In the process of the digital transformation of companies, employees play an essential role in the use of modern technologies (IS), so the following indicators were analyzed:

- Enterprises that employ ICT specialists expressed as a percentage of enterprises employing specialists—IS1;
- Enterprises that provide training to develop/upgrade the ICT skills of their personnel, expressed as a percentage of total enterprises—IS2.

From among the indicators of sustainable performance, the study approaches one indicator for each economic, social, and environmental variable:

- For the economic performance indicator, the indicator of turnover per person employed, expressed in thousand EUR—EP was considered;
- Annual net earnings (single person without children earning 100% of the average earnings), expressed in thousand EUR—SP, was considered representative of the social component;
- As the principal environmental indicator at the corporate level, information regarding greenhouse gases was collected, expressed in million tons—NP.

3.2. Creating the Structural Model

To achieve sustainable performance along with the financial-accounting indicators, companies place more emphasis on reporting social performance indicators and environmental protection indicators. Thus, sustainability reporting must include a range of information on environmental performance (energy efficiency, climate change, greenhouse gas emissions, air and water quality, deforestation, and waste management), social aspects that examine how a company fosters its people and culture, and how this impacts on the wider community (inclusion, gender, and diversity, employee engagement, customer satisfaction, data protection, privacy, community relations, human rights, labor standards), about governance that considers a company's internal system of controls, practices, and procedures (compliance, board structure, executive compensation, internal controls, and shareholder rights, political contributions, environmental and social policies, and any other issues related to how a company interacts with the government) [2].

The study is structured in two parts to identify the role of digitization on the sustainable performance reporting of companies at the EU level.

To achieve the research objectives, in the first part, based on the analysis of the specialized literature and our observations, we developed a conceptual model that was the basis for testing the formulated hypotheses (H1–H7). By the reviewed literature and formulated hypotheses, a conceptual model with ten constructs is proposed: (1) Connectivity (CO); (2) Websites and use of social media (WS); (3) Information management tools (IM); (4) Electronic commerce (EC); (5) E-Government (EG); (6) Other uses of ICTs (IT); (7) ICT skills (IS); (8) Economic performance indicator (EP); (9) Social performance indicator (SP); (10) Environmental performance indicator (NP). The model variables were divided into seven

exogenous (independent) and three endogenous (dependent) variables, each represented by a certain number of articles. The constructs, the number of items for each construct, and their corresponding coding are presented in Table 1.

Table 1. Constructs, items, and coding for structural model.

Latent Variables	Construct	Items	Coding	Source
Exogenous Latent Variables	Connectivity (CO)	Enterprises with (fixed/mobile) broadband	CO1	[31,36–44]
		Persons employed with access to the internet for business purposes	CO2	
		Persons employed, which were provided a portable device that allows a mobile connection to the internet for business use	CO3	
	Websites and use of social media (WS)	Enterprises having a website	WS1	[46–60]
		Use of social media: social networks, blogs, file sharing, wikis	WS2	
	Information management (IM)	Enterprises using ERP software	IM1	[38,73,74]
		Enterprises using CRM software	IM2	
		Enterprises receiving e-invoices	IM3	[67,84–89]
		Enterprises sending e-invoices	IM4	
	Electronic commerce (EC)	Enterprises with web sales (via websites, apps or marketplaces)	EC1	[92–97]
		Enterprises with web sales—B2B and B2G	EC2	
		Enterprises with web sales—B2C	EC3	
	E-Government (EG)	Use of the Internet to interact with public authorities	EG1	[100–104]
	Other uses of ICTs (IT)	Buy cloud computing services used over the internet	IT1	[67,68,105, 106]
	ICT skills (IS)	Enterprises that employ ICT specialists	IS1	[5,39,67,68, 106,108,111–113]
		Enterprises that provided training to develop/upgrade ICT skills of their personnel	IS2	
EndogenousLatent Variables	Economic performance indicator (EP)	Turnover per person employed	EP	[114,115, 123–127]
	Social performance indicator (SP)	Annual net earnings (single person without children earning 100% of the average earning)	SP	
	Environmental performance indicator (NP)	Greenhouse gases	NP	[17,116–118,129–132,136,138–143]

Once the variables in the model were identified, the relationships between them were estimated based on linear regressions and modeling structural equations (SEM).

The second part of the study is devoted to identifying a ranking of digitization indicators according to their impact on sustainability performance indicators using structural equation modeling and neural networks (ANN).

3.3. Estimating Relationships between Variables Using Linear Regressions

The impact of digital transformation indicators on sustainability indicators is investigated using the linear regression model for each endogenous variable with each exogenous variable:

$$Y_{ti} = \alpha + \beta X_{tj} + u_t, \tag{1}$$

where:

- $t = 1, \ldots t,$—years;

- Y—the natural logarithms of the endogenous variables (LEP, LSP, and LNP) at time t (variables in natural logarithms are interpreted as growth rate);
- X—the exogenous variables (CO1, CO2, CO3, WS1, WS2, IM1, IM2, IM3, IM4, EC1, EC2, EC3, EG1, IT1, IS1, IS2) at time t;
- i—the values of the exogenous variables (LEP, LSP, and LNP);
- j—the values of the components of the endogenous variables (CO1, CO2, CO3, WS1, WS2, IM1, IM2, IM3, IM4, EC1, EC2, EC3, EG1, IT1, IS1, IS2);
- The terms, $\alpha\ \beta$, are the unknown parameters to be estimated, and u_t, are the error terms.

After the parameterization, a test of the stationarity of the variables will be carried out, and the degree of their cointegration will be identified. The Augmented Dickey–Fuller (ADF) test will be used to verify and identify the integration order of the time series. If the data series are found to be integrated in the same order, the cointegration relationship is tested using the Johansen cointegration procedure. Then the long-term causality relationships and the direction of causality between variables will be studied using cointegration tests, error correction models, and Granger causality tests between digital transformation indicators (exogenous variables) and sustainable performance indicators (endogenous variables). Next, the model validity (cointegration equation) will be checked by applying the White test to see if the random errors are homoscedastic. The econometric analysis will be performed with the EViews 13 software application.

3.4. SEM-ANN Model

To rank the influence factors of digital transformation on sustainable performance reporting, SEM will be used because it simultaneously processes several related dependent variables, estimating at the same time the structure, the relationship of the factors, and the degree of fit of the model as a whole. SEM is used because sustainability reporting and digital indicators with their influencing factors have multidimensional characteristics and are difficult to measure directly [145]. At the same time, SEM is an intensive tool used for multivariate analysis in the economic field because it allows the examination of a set of relationships between one or more independent variables and one or more dependent variables [133].

The structural model equation is set as follows:

$$\eta = \beta\eta + \Gamma\xi + \zeta, \tag{2}$$

where β is the coefficient matrix of the result latent variable η, and also the path coefficient matrix between the result latent variables; Γ is the coefficient matrix of the cause latent variable ξ, and also the path coefficient matrix of the cause latent variables to the corresponding endogenous latent variable; ζ is the residual term of the structural equation, which is the part failed to explain within the model.

After determining the ranking of the impact of the variables, the models are validated using ANN since this can produce more accurate predictions than SEM [67,146]. This study used the artificial neural network multilayer perceptron (MLP) model because it is very flexible to be applied to the indicators analyzed and compatible with the regressions used. MLP has an architecture of three main layers: input, output, and a hidden layer. The hidden neurons (nodes) are generated automatically. The hyperbolic tangent activation function is used for the hidden layer and the Sigmoid function for the output one. For each neural network constructed, the activation functions identify the capability and performance of the neural network (hidden layer) and the validity of the regression model (output layer). The magnitude of the connection between nodes and the significance of the relationship (direct or indirect) between nodes is given by the synaptic weight. To check if the architecture of the constructed neural network best matches the analyzed data, the additional parameter bias will be used. The data sets will be divided into training and test data, and the prediction accuracy of the network will be measured using ten-fold cross-validation [147].

The prediction accuracy of the ANN model is evaluated by calculating the root mean square error (RMSE) for both datasets using Equation (3) [148]:

$$\text{RMSE} = \sqrt{\frac{1}{N} \times \text{SSE}} \tag{3}$$

where SSE is the sum of squares error and N is the number of elements.

The collected data will be processed using IBM SPSS Statistics 26.0 software to verify the validity of the conceptual model and IBM SPSS AMOS 26.0 software to validate the structural model.

4. Results and Discussion

4.1. Analysis of the Relationship between Sustainability Performance Reporting Indicators and Those of Digitization—Hypothesis Testing

To test the validity of hypotheses H1–H7, we first used regression models to determine the relationships between variables. Then through SEM, we identified the significance of each indicator on the economic, social, and environmental performance.

To determine the existence of the relationship and its meaning between each of the sustainable reporting indicators (EP, SP, NP) and each of the digitalization indicators (CO, WS, IM, EC, EG, IT, IS), the regression equations were estimated linear, considering as dependent variables (y) the logarithmic values of sustainable reporting indicators (LEP, LSP, and LNP) and as independent variables digital transformation indicators (x). The sustainable performance variables were taken in logarithmic form and interpreted as elasticity coefficients (elasticity expresses how strongly digitalization indicators change relative to changes in digital reporting indicators).

The estimation parameters of the regression equations are presented in Table A1. Based on the analysis, it is found that the estimated coefficients in most of the equations (except IM1 and EC2) are statistically significant at a significance level of 1% because the probability for the estimated coefficients is 0, so the hypothesis that they are equal to 0 is rejected. The test results show that the linear regression coefficients are relevant for determining the impact of digitization indicators on sustainable performance indicators.

The values of the estimated regression coefficients $\hat{\beta}_i$ corresponding to the independent variables (CO1, CO2, CO3, WS1, WS2, IM1, IM2, IM3, IM4, EC1, EC2, EC3, EG1, IT1, IS1, IS2) determined for linear regressions having as variables dependent LEP and LSN show a favorable impact on these indicators of sustainable reporting (Table A1).

The results of the regression equations with LNP as the dependent variable (Table A1) show that the coefficients determined for this linear regression are significant least at the 10% level, but have negative values, which means that an increase in digitalization indicators leads to a decrease in the consumption of gas emissions, which is favorable for the transition to an ecological economy.

Consequently, these regression models are relevant for determining the impact of digitalization on sustainable performance reporting indicators.

Testing the stationarity and identifying the degree of integration of the time series by applying the ADF test was conducted for the level series. The results show that EP, SP, and NP time series are non-stationary (being at nominal values). Thus, several statistical tests were used to transform them into stationary series. Time series become stationary and integrated at the first difference for all variables analyzed at least at the 10% level (Table A2).

The analysis of the data series after they have been stationary by differentiation and by removing the trend presents the disadvantage of the loss of the informational content of the data, especially in terms of long-term dynamics. This disadvantage is overcome by analyzing the cointegration relationship by applying the Johansen test. The results for testing the cointegration of the variables indicate the existence of a cointegration relationship between the variables at the 5% significance level (Table A3), which means that

there is a long-term equilibrium relationship between the variables, and therefore, there is a Granger causality between them, in at least one direction.

Performing the Granger causality test, the following results are obtained (Table A3):

- There is bidirectional causality between: LEP and WS2; LSP and WS1, WS2, IM2, IM3, EG1; LNP and CO1, CO3, WS1, WS2;
- There is unidirectional causality, between LEP and IS1 and IS2; LSP and IM1, EC2, IS1; LNP and IM2, EC1, EC2, EC3;
- There is unidirectional reverse causality between LEP and CO2, CO3, WS1, IM4, EC1, EC2, EC3, EG1, IT1; LSP and CO1, CO2, CO3, IM4, EC1, EC3, IT1, IS2; LNP and CO2, IM3, IM4, EG1, IT1, IS1, IS2;
- There is no causality between LEP and CO1, IM1, IM2, IM3; LNP and IM1.

It continues by checking the model validity (cointegration equation) by applying the White test to see if the random errors are homoscedastic. It is found that there is homoscedasticity thus, the chosen models are valid, respectively, the variance of the model about the explanatory variables remains constant.

It is observed that there is a long-term equilibrium relationship between the variables, with various types of Granger causality between them (Table A4), depending on the level of influence of the digital transformation indicators on the sustainability reporting indicators, results confirmed by other studies [6,11,16,18].

From these results, it can be concluded that the regression models are validated and the hypotheses H1–H7 are verified in the sense that the digitalization indicators CO, WS, IM, EC, EG, IT, and IS have a positive influence on the indicators that measure economic (EP) and social (SP) performance. At the same time, the digitalization indicators are in an inverse relationship with the environmental indicator (NP), which demonstrates within the proposed model that the influence of digitalization is negative and determines the reduction of carbon emissions.

After identifying the relationships between the variables through the regression equations, we went on to evaluate the significance of the impact of digitization on sustainable reporting through SEM.

The diagram of the relationships between the variables is shown in Figure A1. Based on the path coefficient values (β), the effect between endogenous and exogenous variables is determined (Table 2).

Table 2. Significance Impact indicators.

LEP		LSP		LNP	
Indicators	Path Coefficient (β) Direct Sense	Indicators	Path Coefficient (β) Direct Sense	Indicators	Path Coefficient (β) Reverse Sense
IM	0.920	WS	0.966	CO	−0.906
IS	0.917	IS	0.958	IT	−0.882
EG	0.897	EG	0.943	EG	−0.865
WS	0.886	IM	0.908	EC	−0.834
CO	0.827	EC	0.898	IM	−0.811
IT	0.784	CO	0.859	WS	−0.805
EC	0.734	IT	0.726	IS	−0.763

It is observed that the β coefficient values, in absolute value, are greater than 0.5, which proves that the indicators chosen in the construction of the SEM models have a very strong effect on the three endogenous variables. However, their impact is different, positive on LEP and LSP (increasing digitalization indicators leads to increased economic and social performance), and negative on LNP (increasing digitalization indicators leads to a reduction in gas emissions). So, hypotheses H1–H7 are also validated by SEM. Due to all the influencing factors of the exogenous variables having values greater than 0.5, it shows that they are relevant for data analysis.

4.2. Ranking the Impact of Digitization Indicators on Sustainable Performance Indicators through the SEM-ANN Model

To rank the impact of digitalization on sustainable reporting, SEM models were used with endogenous variables (LEP, LSP, and LNP) and exogenous variables (CO, WS, IM, EC, EG, IT, IS) (Figure A1, Table 2), which then they were validated through artificial neural networks (ANN). In establishing the prediction of the relationship between exogenous and endogenous variables, it is observed that the weight of the first six digitization indicators (CO, WS, IM, EC, EG, IT) is significantly different from zero for *p*-values at the 0.001 level (two-tailed). At the same time, it is found that for IS, the prediction is significantly different from zero for *p*-value 0.001 (two-tailed), only for LEP and LSP, and for LNP, it is significantly different from zero for *p*-value 0.01 (two-tailed).

In the structural equation models, the interaction between variables was measured by fit indices: Chi-square has an insignificant result for the test at a 0.05 threshold, and RMSEA (root mean square error of approximation), between 0.06 and 0.08. The values obtained demonstrate a sound significance of SEM.

After the SEM model analyses, building neural networks proceeded to validate the results. MLPs of ANNs are constructed to determine the effects of the seven digital transformation indicators on each of the three sustainable performance reporting indicators. MLP model has only one hidden layer considered, which may be the increase in investment in digitalization.

Digitalization indicators are used as inputs to the ANN to highlight the relevant importance of each predictor variable. Estimation of the parameters of the relationships between the variables, resulting from the construction of neural networks with one input layer each defined by the digitization indicators (CO, WS, IM, EC, EG, IT, IS2) and one output layer each defined by LEP, LSP, and LNP is presented in Table 3 and Figure 1. We will have seven input layers (predictors) and one output layer each (LEP, LSP, and LNP).

Table 3. Estimation of MLP parameters.

Exogenous Variable		Endogenous Variable		Endogenous Variable		Endogenous Variable	
		Hidden Layer 1	Output Layer	Hidden Layer 1	Output Layer	Hidden Layer 1	Output Layer
		H(1:1)	LEP	H(1:1)	LSP	H(1:1)	LNP
Input Layer	(Bias)	−0.051	-	−0.190	-	0.358	-
	CO	−0.190	-	−0.221	-	−0.737	-
	WS	−0.447	-	−0.952	-	−0.150	-
	IM	−0.605	-	−0.449	-	−0.289	-
	EC	−0.088	-	−0.260	-	−0.354	-
	EG	−0.469	-	−0.608	-	−0.555	-
	IT	−0.185	-	−0.049	-	−0.556	-
	IS	−0.532	-	−0.645	-	−0.043	-
Hidden Layer 1	(Bias)	-	−0.300	-	0.091	-	0.382
	H(1:1)	-	−1.517	-	−1.822	-	1.512

The hyperbolic tangent function shows that the hidden layer (H(1:1)) (which may be represented by increases in digitalization investment) has a significant impact on neural network performance. Synaptic weight identifies a direct relationship between digitization indicators and LEP and LSP, and an indirect relationship between digitalization indicators and LNP. These demonstrate the validity of the model.
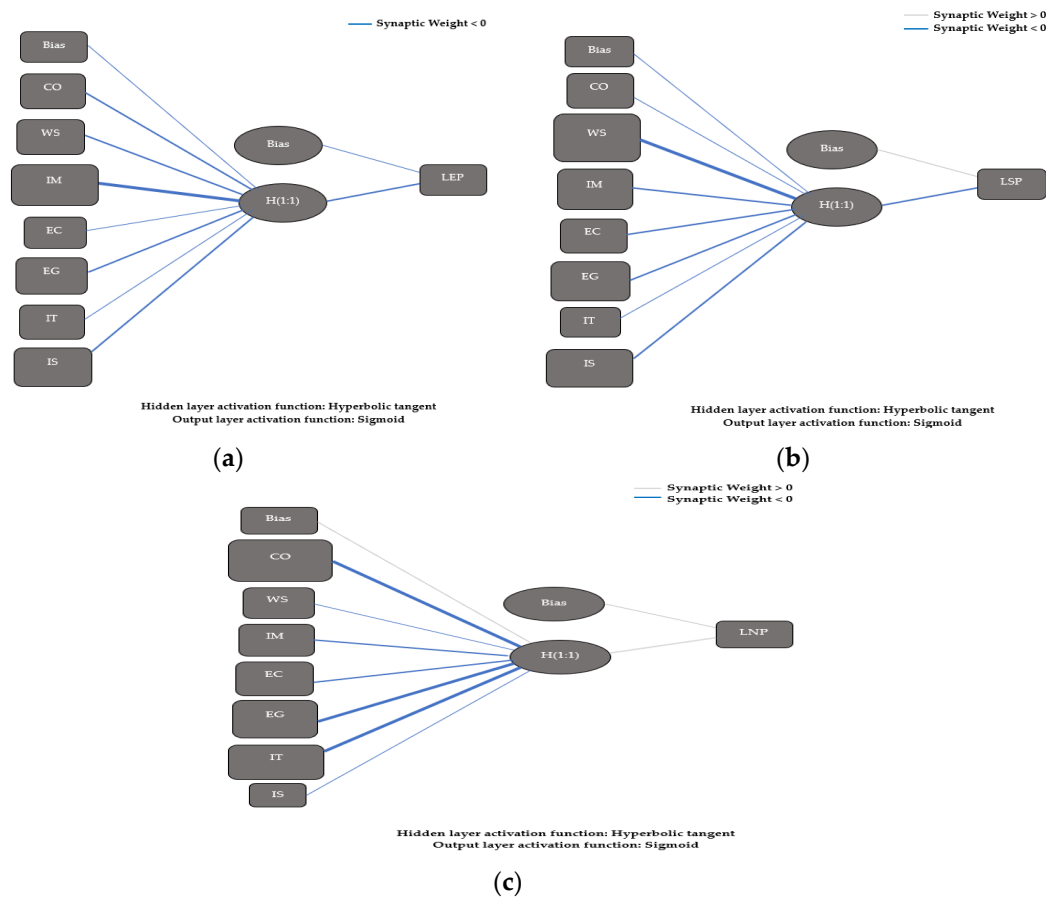
Figure 1. MLP network for identifying the influences of digital transformation indicators on economic performance (**a**), social performance (**b**), and environmental performance (**c**).

The additional parameter bias demonstrates that the constructed neural networks are the most suitable for the analyzed data, thus, the regression models are validated.

The effect of digital indicators on sustainability performance may be amplified by the increase in digitalization investments.

According to SEM, there is an interaction between the variables thus, the ANN models are fit until the models with the most suitable effects are identified. For the optimization of the ANN model, the data sets are divided into training and test data, the proportion of which differs in the three ANNs due to the parameter optimization process (Table 4). In determining the prediction accuracy, the root mean square error (RMSE) was analyzed for both data sets. For each model, the neural network was run 10 times, which determined a decrease in the RMSE values (values close to 0), demonstrating a good fit of the data and a high prediction accuracy of the models (Table 4) [146]. The most suitable model for each of the three fitted ANNs is ANN10 (Table 4).

The relative importance of each input predictor (digitalization indicators) to each sustainable performance reporting indicator was calculated by the normalized ranking of relative importance (expressed as %) using sensitivity analysis (Table 5). The ranking of independent variables by ANN confirms the impact determined using SEM models.

Based on the importance of the normalized variable, it is found that for the increase in economic performance (EP), expressed by the turnover per employee, the greatest importance is the use of modern tools in information management (IM). From the point of view of social performance (expressed by annual net earnings), the greatest importance is presented by the use of websites and social media (WS). Connectivity (CO) has the strongest impact on environmental performance indicators (expressed by greenhouse gases).

Table 4. RMSE values for the ANN model.

Neural Network	Input: CO, WS, IM, EC, EG, IT IS/Output: LEP				Input: CO, WS, IM, EC, EG, IT IS/Output: LSP				Input: CO, WS, IM, EC, EG, IT IS/Output: LNP			
	Training Dataset (63.6%)		Testing Dataset (36.4%)		Training Dataset (72.7%)		Testing Dataset (27.3%)		Training Dataset (81.8%)		Testing Dataset (18.2%)	
	SSE	RMSE	SSE	RMSE	SSE	RMSE	SSE	RMSE	SSE	RMSE	SSE	RMSE
ANN1	0.099	0.119	0.087	0.148	0.097	0.110	0.097	0.179	0.071	0.089	0.087	0.209
ANN2	0.087	0.112	0.074	0.136	0.094	0.108	0.094	0.177	0.064	0.084	0.084	0.205
ANN3	0.087	0.112	0.068	0.130	0.088	0.105	0.084	0.167	0.058	0.080	0.074	0.192
ANN4	0.075	0.104	0.063	0.126	0.078	0.099	0.078	0.161	0.058	0.080	0.068	0.184
ANN5	0.072	0.101	0.060	0.123	0.062	0.088	0.070	0.153	0.052	0.076	0.050	0.158
ANN6	0.070	0.100	0.058	0.120	0.060	0.087	0.068	0.150	0.040	0.067	0.038	0.138
ANN7	0.066	0.097	0.046	0.107	0.060	0.087	0.066	0.148	0.040	0.067	0.036	0.134
ANN8	0.066	0.097	0.042	0.103	0.056	0.084	0.052	0.131	0.036	0.063	0.027	0.116
ANN9	0.065	0.096	0.037	0.096	0.055	0.083	0.047	0.125	0.035	0.062	0.022	0.105
ANN10	0.063	0.095	0.035	0.094	0.053	0.081	0.025	0.091	0.023	0.050	0.012	0.077
	Mean	0.103	Mean	0.1182	Mean	0.093	Mean	0.148	Mean	0.071	Mean	0.152

Table 5. Normalized variable relative importance.

Predictors	LEP			LSP			LNP		
	ARI	NI (%)	Ranking	ARI	NI (%)	Ranking	ARI	NI (%)	Ranking
CO	0.069	29.9%	5	0.054	15.6%	6	0.312	100.0%	1
WS	0.182	79.1%	4	0.348	100.0%	1	0.046	14.7%	6
IM	0.230	100.0%	1	0.129	37.1%	4	0.113	36.0%	5
EC	0.032	13.9%	7	0.070	20.1%	5	0.114	36.6%	4
EG	0.192	83.5%	3	0.168	48.4%	3	0.198	63.5%	3
IT	0.068	29.4%	6	0.011	3.3%	7	0.204	65.3%	2
IS	0.226	98.1%	2	0.219	63.0%	2	0.013	4.3%	7

Notes: ARI—Average relative importance; NI—Normalized importance.

ICT skills (IS), which show the importance given to employed staff to know how to work with digital tools, ranks 2nd in terms of impact on increasing economic and social performance. The 2nd place in terms of importance among environmental performance indicators is occupied by companies' use of cloud computing (IT).

The E-Government (EG) indicator has a significant contribution to the three categories of sustainable reporting indicators, occupying position 3 in terms of importance.

Following the analysis, it is noted that intensive use of digitalization generates an increase in economic performance, a conclusion that also emerged from other specialized works [126,133,136,149]. At the same time, digitalization has a positive impact on social performance, improving working conditions and increasing the work performance of employees, which contributes to increasing their incomes; these findings were also found by other authors [17,127–131]. Given the need to protect the environment, the use of digital technologies contributes to sustainable development, thus an increase in the value of these indicators leads to a decrease in environmental indicators (gas emissions) results also found in other studies [132–137,141].

The modeling of structural equations and the construction of artificial neural networks highlight the direct or indirect effect of digitization indicators on sustainability reporting, with different intensities; these results were also found in other specialized research [18,24,30,126]. SEM and ANN confirmed the results obtained by testing the multifactorial linear equations.

5. Conclusions

Europe aims to be a climate-neutral continent by 2050 [150], thus the European Union believes that companies' sustainability reporting can play a significant role in achieving this goal. Sustainability reporting is fast becoming an essential part of the business landscape. Companies consider the needs of consumers of their products or services to survive and they are becoming more aware of this.

Company reports are geared towards aligning resources and adopting successful business practices by providing relevant performance information against all corporate sustainability achievements and challenges. Companies are constantly adapting their approach to reporting by monitoring and enforcing sustainability practices, as well as reforming policies to ensure that current needs can be met without sacrificing the needs of future generations. An essential aspect of sustainability reporting is the information collection and communication to be evaluated by stakeholders. In this regard, digital technologies are considered to be real drivers in sustainability reporting, as companies must effectively manage the large amount of information related to environmental, social, and governance factors and integrate them into existing reporting systems. Digitalization of business processes was one of the main ways through which companies managed to cope with the pressure of the COVID-19 crisis, putting significant pressure on firms regarding the remodeling of their business processes. The pandemic had more impact on companies' transition to digital transformation to improve threats and opportunities management, demonstrating the need for EU states to make relevant and real-time decisions.

Based on these considerations, the study of specialized literature was oriented towards identifying the role of digitalization indicators on the economic, social, and environmental performance of companies, with a view to the transition of companies to sustainability reporting. Thus, the study was structured in two directions. In the first part, we created a conceptual model and tested the relationships between its variables. The parameters of the linear regression equations were estimated, and the cointegration and causality of the variables were tested, establishing a long-term equilibrium relationship between them in at least one direction. The second direction identified the impact and intensity of digitalization indicators on sustainability performance reporting indicators using SEM-ANN models.

Based on this research, the study has a series of practical and theoretical implications that may be relevant in the conditions where the digitalization of companies is of significant importance for the European Union to achieve sustainable development that ensures a better future for community members. This study adds value to existing investigations by creating a conceptual model that includes a series of digitalization indicators that compete for sustainable performance. At the same time, it is a novelty to test the relationship between the considered indicators and then to identify their meaning and intensity by approaching modeling through structural equations and building neural networks. The SEM-ANN model made to measure the impact of digitization indicators on sustainability performance provided a possible new research methodology paradigm.

The practical implications of our empirical research carried out at the level of the European Union allow us to state that the increase in the use of information technologies at the level of companies has a significant favorable influence on their economic and social performance. At the same time, implementation of modern technologies at the company level leads to sustained protection of the environment (providing a clean environment for the next generations) by reducing polluting factors. From a practical perspective, the proposed analysis model can become a framework for creating dashboards at the macro or microeconomic levels with key indicators that are the basis of sustainability reporting. Thus, starting from the model developed in this paper, companies can create dashboards to support the analysis and monitoring of sustainable performance in the conditions of the digital era, giving significant importance to digitalization indicators. Thus, the results of this study can be the basis for carrying out other research, potentially having an essential role in establishing economic and environmental strategies at the European level but also at the level of each member country to stimulate the increase in the number of companies

that carry out sustainability reports. At the same time, the study can be the basis for governmental and European policies to stimulate sustainable economic growth and adopt appropriate measures.

Following this study, we found that at the level of the European Union, digitalization indicators have a significant direct influence on economic and social performance, and a strong impact, but in the opposite direction on environmental performance (digitalization leads to the reduction of polluting factors). Thus, each member state of the European Union must be aware that, to increase the well-being of its citizens, consistent sustainable policies are needed to protect the environment.

As a limitation of our research, it should be mentioned that this research was carried out at the level of the European Union, and the situation of the member countries has significant differences, both concerning each other and concerning the states of other continents. We propose that in the future investigation, we will perform an analysis of groups of states from each continent to capture the impact of the digital transformation adopted by companies on sustainability reporting.

Appendix A

Table A1. Estimating the regression curve and linear regression parameters.

Indicator	R^2	S.E.R.	Prob.	α_i			β_i		
				Coef.	Std. Error	Prob.	Coef.	Std. Error	Prob.
				LEP					
CO1	0.800	0.018	0.000 ***	4.245	0.168	0.000 ***	0.011	0.002	0.000 ***
CO2	0.789	0.019	0.000 ***	4.907	0.060	0.000 ***	0.007	0.001	0.000 ***
CO3	0.754	0.020	0.001 ***	5.100	0.030	0.000 ***	0.007	0.001	0.001 ***
WS1	0.720	0.022	0.001 ***	4.410	0.175	0.000 ***	0.011	0.002	0.001 ***
WS2	0.732	0.021	0.001 ***	5.095	0.032	0.000 ***	0.004	0.001	0.001 ***
IM1	0.517	0.029	0.013 **	5.091	0.052	0.000 ***	0.005	0.002	0.013 **
IM2	0.615	0.025	0.004 ***	4.838	0.109	0.000 ***	0.013	0.003	0.004 ***
IM3	0.756	0.020	0.001 ***	3.485	0.335	0.000 ***	0.019	0.004	0.001 ***
IM4	0.850	0.016	0.000 ***	5.079	0.025	0.000 ***	0.003	0.000	0.000 ***
EC1	0.646	0.024	0.003 ***	5.053	0.050	0.000 ***	0.013	0.003	0.003 ***
EC2	0.525	0.028	0.012 **	4.997	0.081	0.000 ***	0.024	0.008	0.012 **
EC3	0.619	0.025	0.004 ***	5.060	0.050	0.000 ***	0.016	0.004	0.004 ***
EG1	0.805	0.018	0.000 ***	1.995	0.534	0.000 ***	0.037	0.006	0.000 ***
IT1	0.615	0.025	0.004 ***	5.165	0.024	0.000 ***	0.004	0.001	0.004 ***
IS1	0.633	0.025	0.003 ***	6.675	0.362	0.000 ***	0.073	0.019	0.003 ***
IS2	0.625	0.025	0.004 ***	4.838	0.107	0.000 ***	0.020	0.005	0.004 ***

Table A1. *Cont.*

Indicator	R^2	S.E.R.	Prob.	α_i			β_i		
				Coef.	Std. Error	Prob.	Coef.	Std. Error	Prob.
				LSP					
CO1	0.890	0.038	0.000 ***	0.075	0.352	0.036 **	0.032	0.004	0.000 ***
CO2	0.787	0.054	0.000 ***	2.108	0.169	0.000 ***	0.020	0.003	0.000 ***
CO3	0.639	0.070	0.003 ***	2.686	0.101	0.000 ***	0.017	0.004	0.003 ***
WS1	0.895	0.038	0.000 ***	0.423	0.303	0.096 *	0.036	0.004	0.000 ***
WS2	0.656	0.068	0.002 ***	2.662	0.103	0.000 ***	0.010	0.002	0.003 ***
IM1	0.831	0.048	0.000 ***	2.506	0.088	0.000 ***	0.017	0.003	0.000 ***
IM2	0.768	0.056	0.000 ***	1.773	0.240	0.000 ***	0.040	0.007	0.000 ***
IM3	0.684	0.065	0.002 ***	1.677	1.078	0.054 *	0.052	0.012	0.002 **
IM4	0.847	0.045	0.000 ***	2.595	0.070	0.000 ***	0.009	0.001	0.000 ***
EC1	0.820	0.049	0.000 ***	2.448	0.100	0.000 ***	0.042	0.007	0.000 ***
EC2	0.695	0.064	0.001 ***	2.251	0.184	0.000 ***	0.079	0.017	0.001 ***
EC3	0.664	0.067	0.002 ***	2.521	0.134	0.000 ***	0.048	0.011	0.002 ***
EG1	0.889	0.039	0.000 ***	6.606	1.141	0.000 ***	0.110	0.013	0.000 ***
IT1	0.527	0.080	0.011 **	2.855	0.075	0.000 ***	0.009	0.003	0.012 **
IS1	0.454	0.086	0.023 **	6.495	1.249	0.001 ***	0.175	0.064	0.023 **
IS2	0.639	0.070	0.003 ***	1.898	0.297	0.000 ***	0.058	0.015	0.003 ***
				LNP					
CO1	0.765	0.035	0.000 ***	16.697	0.320	0.000 ***	−0.018	0.003	0.000 ***
CO2	0.804	0.032	0.000 ***	15.578	0.101	0.000 ***	−0.012	0.002	0.000 ***
CO3	0.706	0.706	0.001 ***	15.225	0.057	0.000 ***	−0.011	0.002	0.001 ***
WS1	0.557	0.048	0.008 ***	16.269	0.388	0.000 ***	−0.018	0.005	0.008 ***
WS2	0.708	0.039	0.001 ***	15.237	0.059	0.000 ***	−0.006	0.001	0.001 ***
IM1	0.431	0.054	0.028 **	15.224	0.100	0.000 ***	−0.008	0.003	0.028 **
IM2	0.485	0.052	0.017 **	15.613	0.222	0.000 ***	−0.020	0.007	0.017 **
IM3	0.731	0.037	0.001 ***	18.022	0.618	0.000 ***	−0.033	0.007	0.001 ***
IM4	0.677	0.041	0.002 ***	15.237	0.063	0.000 ***	−0.005	0.001	0.002 ***
EC1	0.703	0.039	0.001 ***	15.331	0.080	0.000 ***	−0.024	0.005	0.001 ***
EC2	0.444	0.054	0.025 **	15.379	0.155	0.000 ***	−0.039	0.015	0.025 **
EC3	0.704	0.039	0.001 ***	15.325	0.078	0.000 ***	−0.031	0.007	0.001 ***
EG1	0.749	0.036	0.001 ***	20.490	1.066	0.000 ***	−0.063	0.012	0.001 ***
IT1	0.778	0.034	0.000 ***	15.138	0.032	0.000 ***	−0.007	0.001	0.000 ***
IS1	0.277	0.061	0.096 *	13.309	0.893	0.000 ***	−0.005	0.046	0.096 *
IS2	0.181	0.065	0.092 *	15.359	0.278	0.000 ***	−0.019	0.014	0.092 *

Notes: * Denotes significance at 10% level; ** denotes significance at 5% level; *** denotes significance at 1% level.

Table A2. Results of the unit roots tests.

Indicators	ADF	
	t-Statistic	Prob.
CO1	−4.34166	0.0382 **
CO2	−4.07366	0.0522 *
CO3	−3.67037	0.0026 ***
WS1	−3.99257	0.0578 *
WS2	−4.83192	0.0276 **
IM1	−3.95286	0.0686 *
IM2	−4.12982	0.0574 *
IM3	−5.04468	0.017 **
IM4	−5.52737	0.0099 ***
EC1	−3.58086	0.003 ***
EC2	−3.01399	0.0752 *
EC3	−3.20618	0.0582 *
EG1	−207.857	0.0001 ***
IT1	−5.3019	0.0129 **
IS1	−4.5153	0.038 **
IS2	−4.20903	0.0523 *
LEP	−3.99101	0.0657 *
LSP	−3.87182	0.066 *
LNP	−2.38238	0.0239 **

Notes: * Denotes significance at 10% level; ** denotes significance at 5% level; *** denotes significance at 1% level.

Table A3. Results of Johansen cointegration test.

Indicators	Probability	Indicators	Probability	Indicators	Probability
LEP-CO1	0.0479	LSP-CO1	0.0003	LNP-CO1	0.0122
LEP-CO2	0.0021	LSP-CO2	0.0000	LNP-CO2	0.0043
LEP-CO3	0.0290	LSP-CO3	0.0000	LNP-CO3	0.0002
LEP-WS1	0.0101	LSP-WS1	0.0001	LNP-WS1	0.0024
LEP-WS2	0.0037	LSP-WS2	0.0000	LNP-WS2	0.0000
LEP-IM1	0.0418	LSP-IM1	0.0000	LNP-IM1	0.0470
LEP-IM2	0.0252	LSP-IM2	0.002	LNP-IM2	0.0072
LEP-IM3	0.0172	LSP-IM3	0.0000	LNP-IM3	0.0201
LEP-IM4	0.0057	LSP-IM4	0.0000	LNP-IM4	0.0020
LEP-EC1	0.0295	LSP-EC1	0.0001	LNP-EC1	0.0274
LEP-EC2	0.0424	LSP-EC2	0.0003	LNP-EC2	0.0019
LEP-EC3	0.0071	LSP-EC3	0	LNP-EC3	0.0367
LEP-EG1	0	LSP-EG1	0.0001	LNP-EG1	0.0132
LEP-IT1	0.0133	LSP-IT1	0	LNP-IT1	0.0068
LEP-IS1	0.0001	LSP-IS1	0.0002	LNP-IS1	0.0436
LEP-IS2	0.0149	LSP-IS2	0.0004	LNP-IS2	0.0013

Table A4. Granger causality.

| Hypot.	t-St.	Prob.	Conc.	Hypot.	t-St.	Prob.	Conc.	Hypot.	t-St.	Prob.	Conc.
LEP-CO1	1.74	0.286	Accept	LSP-CO1	0.87	0.486	Accept	LNP-CO1	3.13	0.092 *	Reject
CO1-LEP	0.59	0.598	Accept	CO1-LSP	16.5	0.012 **	Reject	CO1-LNP	4.24	0.093 *	Reject
LEP-CO2	1.07	0.595	Accept	LSP-CO2	0.31	0.752	Accept	LNP-CO2	0.88	0.378	Accept
CO2-LEP	15.7	0.061 *	Reject	CO2-LSP	13.7	0.000 ***	Reject	CO2-LNP	4.33	0.076 *	Reject
LEP-CO3	0.28	0.614	Accept	LSP-CO3	2.14	0.233	Accept	LNP-CO3	43.4	0.011 **	Reject
CO3-LEP	3.39	0.100 *	Reject	CO3-LSP	27.8	0.005 ***	Reject	CO3-LNP	52.5	0.091 *	Reject
LEP-WS1	0.29	0.839	Accept	LSP-WS1	3.13	0.092 *	Accept	LNP-WS1	4.62	0.091 *	Reject
WS1-LEP	14.5	0.066 *	Reject	WS1-LSP	2.95	0.096 *	Reject	WS1-LNP	37.3	0.091 *	Reject
LEP-WS2	21.3	0.016 **	Reject	LSP-WS2	3.01	0.099 *	Reject	LNP-WS2	19.5	0.000 ***	Reject
WS2-LEP	6.99	0.033 **	Reject	WS2-LSP	30.7	0.004 ***	Reject	WS2-LNP	6.58	0.054 *	Reject
LEP-IM1	0.15	0.706	Accept	LSP-IM1	2.91	0.092 *	Reject	LNP-IM1	0.18	0.842	Accept
IM1-LEP	0.99	0.352	Accept	IM1-LSP	0.04	0.953	Accept	IM1-LNP	1.52	0.323	Accept
LEP-IM2	0.79	0.513	Accept	LSP-IM2	4.06	0.084 *	Reject	LNP-IM2	2.66	0.097 *	Reject
IM2-LEP	1.09	0.418	Accept	IM2-LSP	12.9	0.009 ***	Reject	IM2-LNP	0.17	0.692	Accept
LEP-IM3	0.93	0.465	Accept	LSP-IM3	4.10	0.098 *	Reject	LNP-IM3	1.22	0.307	Accept
IM3-LEP	1.71	0.290	Accept	IM3-LSP	19.1	0.009 ***	Reject	IM3-LNP	3.49	0.094 *	Reject
LEP-IM4	0.62	0.706	Accept	LSP-IM4	1.69	0.293	Accept	LNP-IM4	2.04	0.465	Accept
IM4-LEP	78.3	0.028 **	Reject	IM4-LSP	52.8	0.001 ***	Reject	IM4-LNP	25.1	0.014 **	Reject
LEP-EC1	0.18	0.683	Accept	LSP-EC1	3.20	0.385	Accept	LNP-EC1	8.18	0.024 **	Reject
EC1-LEP	3.74	0.094 *	Reject	EC1-LSP	28.4	0.097 *	Reject	EC1-LNP	0.18	0.677	Accept
LEP-EC2	0.23	0.649	Accept	LSP-EC2	6.92	0.050 *	Reject	LNP-EC2	16.0	0.012 **	Reject
EC2-LEP	4.94	0.062 *	Reject	EC2-LSP	0.63	0.578	Accept	EC2-LNP	1.27	0.372	Accept
LEP-EC3	2.06	0.243	Accept	LSP-EC3	2.35	0.212	Accept	LNP-EC3	4.96	0.061 *	Accept
EC3-LEP	5.89	0.064 *	Reject	EC3-LSP	5.53	0.071 *	Reject	EC3-LNP	0.51	0.495	Accept
LEP-EG1	0.56	0.479	Accept	LSP-EG1	12.1	0.000 ***	Reject	LNP-EG1	1.42	0.342	Accept
EG1-LEP	3.25	0.095 *	Reject	EG1-LSP	27.8	0.005 ***	Reject	EG1-LNP	2.70	0.091 *	Reject
LEP-IT1	2.98	0.397	Accept	LSP-IT1	0.66	0.567	Accept	LNP-IT1	1.03	0.433	Accept
IT1-LEP	49.9	0.033 **	Reject	IT1-LSP	10.6	0.025 **	Reject	IT1-LNP	8.49	0.036 **	Reject
LEP-IS1	9.37	0.031 **	Reject	LSP-IS1	3.53	0.092 *	Reject	LNP-IS1	0.56	0.605	Accept
IS1-LEP	0.97	0.453	Accept	IS1-LSP	0.19	0.673	Accept	IS1-LNP	3.15	0.090 *	Reject
LEP-IS2	26.9	0.091 *	Reject	LSP-IS2	12.6	0.207	Accept	LNP-IS2	0.33	0.732	Accept
IS2-LEP	1.98	0.472	Accept	IS2-LSP	39.6	0.038 **	Reject	IS2-LNP	6.12	0.060 *	Reject

Note: * Denotes that the null hypothesis is rejected at 0.1 level; ** denotes that the null hypothesis is rejected at 0.05 level; *** denotes that the null hypothesis is rejected at 0.01 level. The null hypothesis is accepted for all other values.
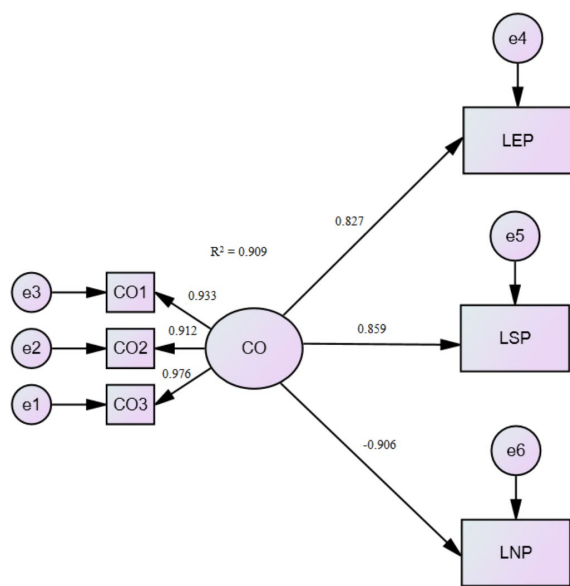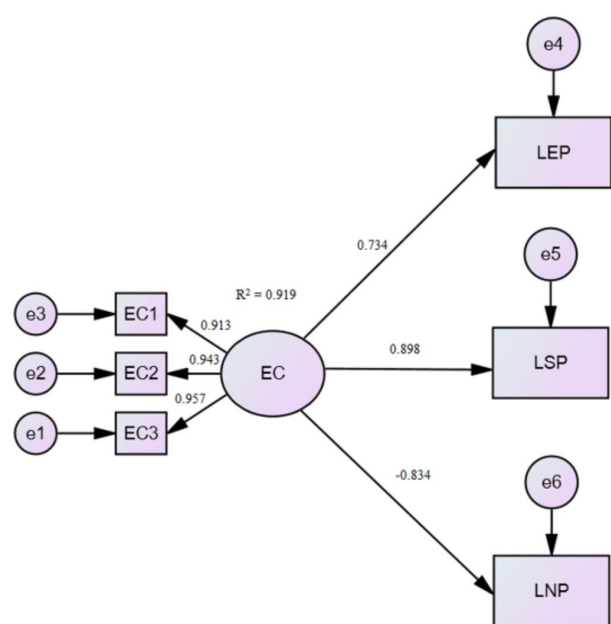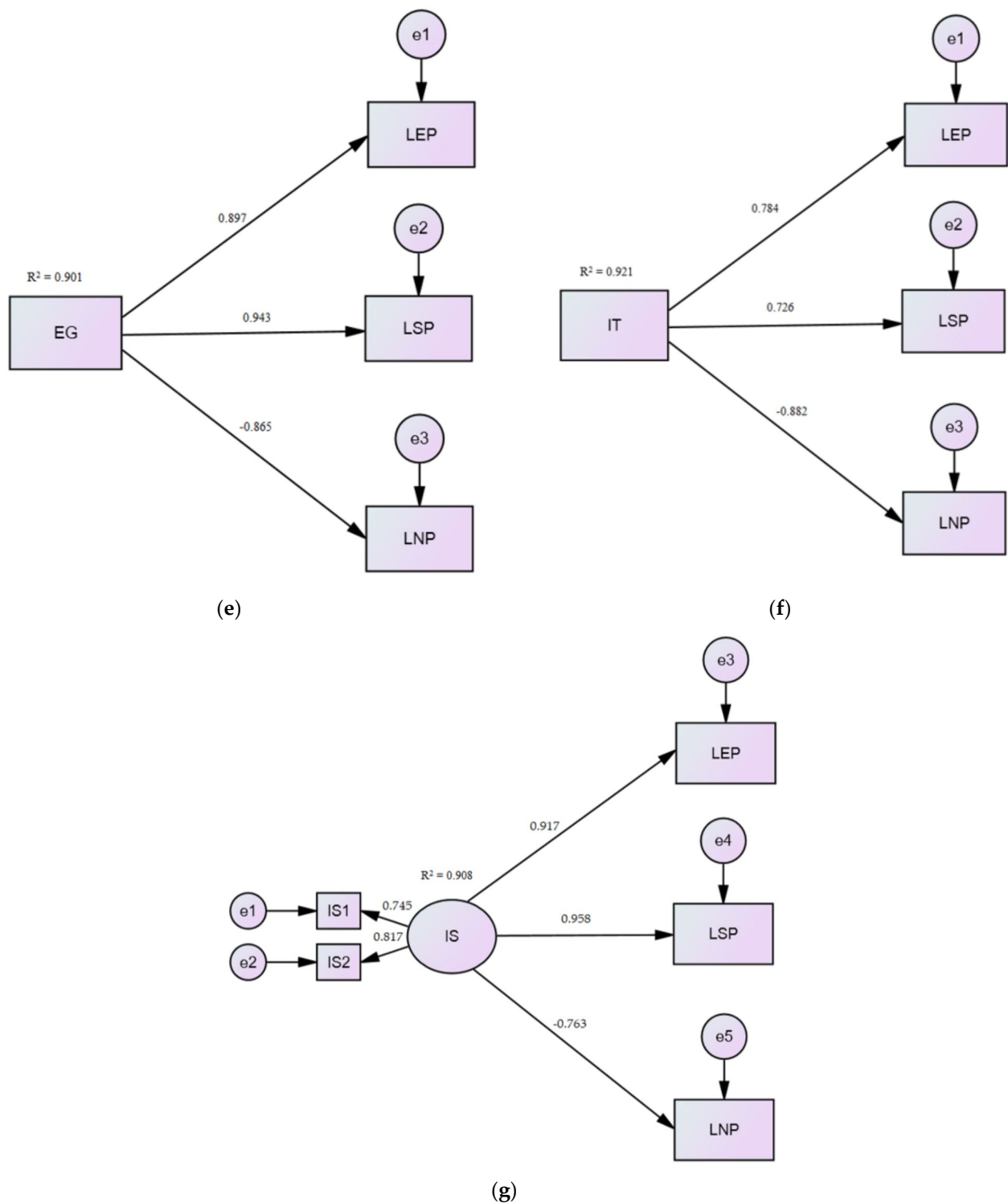
(**a**)

(**b**)

(**c**)

(**d**)

Figure A1. *Cont.*

(e)

(f)

(g)
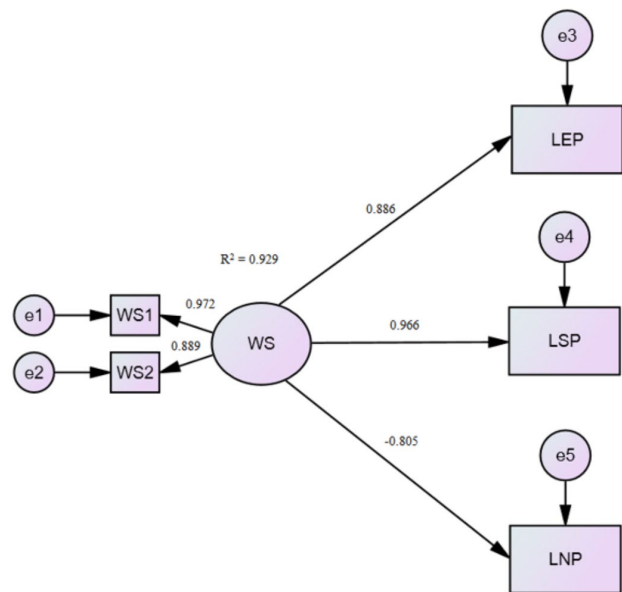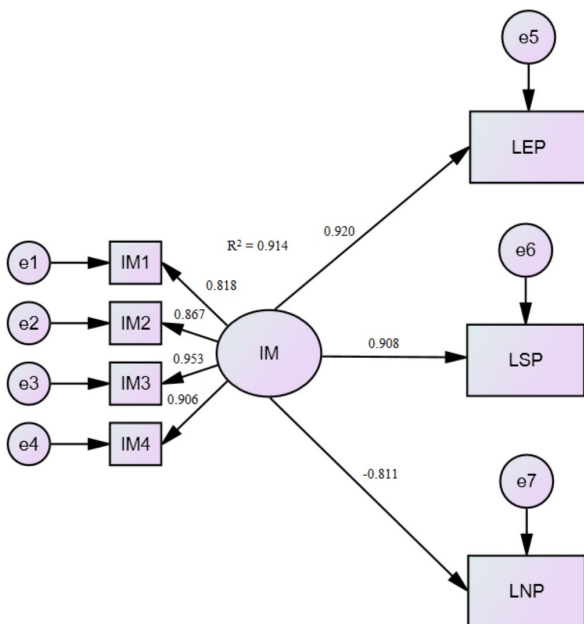
Figure A1. The diagram of the relationships in structural equation modeling: (**a**) CO, (**b**) WS, (**c**) IM, (**d**) EC, (**e**) EG, (**f**) IT, (**g**) IS on LEP, LSP, and LNP.

References

1. EUR-Lex. Regulation (EU) No 537/2014 of the European Parliament and of the Council of 16 April 2014 on Specific Requirements Regarding Statutory Audit of Public-Interest Entities and Repealing Commission Decision 2005/909/EC. Available online: http://data.europa.eu/eli/reg/2014/537/oj (accessed on 10 December 2022).
2. EUR-Lex. Directive (EU) 2022/2464 of the European Parliament and of the Council of 14 December 2022 Amending Regulation (EU) No 537/2014, Directive 2004/109/EC, Directive 2006/43/EC and Directive 2013/34/EU, as Regards Corporate Sustainability

Reporting—Corporate Sustainability Reporting Directive (CSRD) COM/2021/189. Available online: http://data.europa.eu/eli/dir/2022/2464/oj (accessed on 10 December 2022).

3. European Comission. Europe's Digital Decade: Commission Sets the Course towards a Digitally Empowered Europe by 2030. Available online: https://ec.europa.eu/commission/presscorner/detail/en/IP_21_983 (accessed on 10 December 2022).

4. Bouchetara, M. The Impact of Digitalization on the Quality of Accounting Information. The Case of Algeria. *Audit Financ.* **2022**, *2*, 295–303. [CrossRef]

5. Gușe, G.R.; Mangiuc, M.D. Digital Transformation in Romanian Accounting Practice and Education: Impact and Perspectives. *Amfiteatru Econ.* **2022**, *24*, 252–267. [CrossRef]

6. Vărzaru, A.A.; Bocean, C.G.; Mangra, M.G.; Mangra, G.I. Assessing the Effects of Innovative Management Accounting Tools on Performance and Sustainability. *Sustainability* **2022**, *14*, 5585. [CrossRef]

7. Abdelraheem, A.; Hussaien, A.; Mohammed, M.; Elbokhari, Y. The Effect of Information Technology on the Quality of Accounting Information. *Accounting* **2021**, *7*, 191–196. [CrossRef]

8. Huy, P.Q.; Phuc, V.K. The Impact of Public Sector Scorecard Adoption on the Effectiveness of Accounting Information Systems Towards the Sustainable Performance in Public Sector. *Cogent Bus. Manag.* **2020**, *7*, 1717718. [CrossRef]

9. Farida, I.; Mulyani, S.; Akbar, B.; Setyaningsih, S.D. Quality and efficiency of accounting information systems. *Utopía Y Prax. Latinoam.* **2021**, *26*, 323–337.

10. Edmunds, A.; Morris, A. The problem of information overload in business organisations: A review of the literature. *Int. J. Inf. Manag.* **2000**, *20*, 17–28. [CrossRef]

11. Rowbottom, N.; Locke, J.; Troshani, I. When the tail wags the dog? Digitalisation and corporate reporting. *Account. Organ. Soc.* **2021**, *92*, 101226. [CrossRef]

12. United Nations. *Transforming Our World: The 2030 Agenda for Sustainable Development*; United Nations Resolution 70/1; United Nations: New York, NY, USA, 2015; Available online: https://sdgs.un.org/2030agenda (accessed on 10 December 2022).

13. Sekarlangit, L.D.; Wardhani, R. The efect of the characteristics and activities of the board of directors on sustainable development goal (SDG) disclosures: Empirical evidence from southeast Asia. *Sustainability* **2021**, *13*, 8007. [CrossRef]

14. Muhmad, S.N.; Arif, A.M.; Majid, N.A.; Kamarudin, K.A. Product market competition, corporate governance and ESG. *Asian Acad. Manag. J. Account. Financ.* **2021**, *17*, 63–91. [CrossRef]

15. Global Reporting Initiatives. The Global Leader for Impact Reporting. 2020. Available online: https://www.globalreporting.org (accessed on 11 January 2023).

16. Šimberová, I.; Korauš, A.; Schüller, D.; Smolíkova, L.; Straková, J.; Váchal, J. Threats and Opportunities in Digital Transformation in SMEs from the Perspective of Sustainability: A Case Study in the Czech Republic. *Sustainability* **2022**, *14*, 3628. [CrossRef]

17. Gulluscio, C.; Puntillo, P.; Luciani, V.; Huisingh, D. Climate Change Accounting and Reporting: A Systematic Literature Review. *Sustainability* **2020**, *12*, 5455. [CrossRef]

18. Brenner, B.; Hartl, B. The perceived relationship between digitalization and ecological, economic, and social sustainability. *J. Clean. Prod.* **2021**, *315*, 128128. [CrossRef]

19. Khan, I.S.; Ahmad, M.O.; Majava, J. Industry 4.0 and sustainable development: A systematic mapping of triple bottom line, Circular Economy and Sustainable Business Models perspectives. *J. Clean. Prod.* **2021**, *297*, 126655. [CrossRef]

20. Klymenko, O.; Halse, L.L.; Jæger, B. The Enabling Role of Digital Technologies in Sustainability Accounting: Findings from Norwegian Manufacturing Companies. *Systems* **2021**, *9*, 33. [CrossRef]

21. Tiwari, K.; Khan, M.S. Sustainability accounting and reporting in the industry 4.0. *J. Clean. Prod.* **2020**, *258*, 120783. [CrossRef]

22. Maki, A.; Al Shammari, A. Modern Trends in the Visual Media Industry. In *From the Internet of Things to the Internet of Ideas: The Role of Artificial Intelligence. EAMMIS 2022. Lecture Notes in Networks and Systems*; Musleh Al-Sartawi, A.M.A., Razzaque, A., Kamal, M.M., Eds.; Springer: Cham, Switzerland, 2023; Volume 557. [CrossRef]

23. Lichtenthaler, U. Digitainability: The Combined Effects of the Megatrends Digitalization and Sustainability. *J. Innov. Manag.* **2021**, *9*, 64–80. [CrossRef]

24. Stoica, M.; Ghilic-Micu, B.; Mircea, M. The telework paradigm in the IoE ecosystem–a model for the teleworker residence choice in context of digital economy and society. *Econ. Comput. Econ. Cybern. Stud.* **2021**, *55*, 263–278. [CrossRef]

25. Coman, D.M.; Ionescu, C.A.; Duică, A.; Coman, M.D.; Uzlau, M.C.; Stanescu, S.G.; State, V. Digitization of Accounting: The Premise of the Paradigm Shift of Role of the Professional Accountant. *Appl. Sci.* **2022**, *12*, 3359. [CrossRef]

26. Nafchi, M.Z.; Mohelská, H. Organizational Culture as an Indication of Readiness to Implement Industry 4.0. *Information* **2020**, *11*, 174. [CrossRef]

27. European Comission. Shaping Europe's Digital Future. The Digital Europe Programme. 2021. Available online: https://digital-strategy.ec.europa.eu/en/activities/digital-programme (accessed on 11 January 2023).

28. Effah, N.A.A.; Wang, Q.; Owusu, G.M.Y.; Otchere, O.A.S.; Owusu, B. Contributions toward sustainable development: A bibliometric analysis of sustainability reporting research. *Environ. Sci. Pollut. Res.* **2023**, *30*, 104–126. [CrossRef] [PubMed]

29. Pineda-Escobar, M.A. Moving the 2030 agenda forward: SDG implementation in Colombia. *Corp. Gov.* **2019**, *19*, 176–188. [CrossRef]

30. Nicholls, J.A. Integrating financial, social and environmental accounting. *Sustain. Account. Manag. Policy. J.* **2020**, *11*, 745–769. [CrossRef]

31. Autio, E.; Mudambi, R.; Yoo, Y. Digitalization and globalization in a turbulent world: Centrifugal and centripetal forces. *Glob. Strategy J.* **2021**, *11*, 3–16. [CrossRef]

32. Stallkamp, M.; Schotter, A.P.J. Platforms without borders? The international strategies of digital platform firms. *Glob. Strategy J.* **2021**, *11*, 58–80. [CrossRef]

33. Gong, Y.; Zhang, L.; Liu, R.; Yu, K.; Srivastava, G. Nonlinear MIMO for Industrial Internet of Things in Cyber–Physical Systems. *IEEE Trans. Ind. Inf.* **2021**, *17*, 5533–5541. [CrossRef]

34. Helmold, M.; Terry, B. Industry 4.0 and Artificial Intelligeninf, e (AI). In *Operations and Supply Management 4.0. Future of Business and Finance*; Helmold, M., Terry, B., Eds.; Springer: Cham, Switzerland, 2021. [CrossRef]

35. Mansoori, S.; Khan, I.S.; Ahokangas, P.; Matinmikko-Blue, M.; Haapasalo, H.; Yrjölä, S. Value Configurations for Data and Connectivity Solutions in Digitalized Future Factories. *Processes* **2021**, *9*, 2233. [CrossRef]

36. Sharma, S.; Behl, R. Strategic Alignment of Information Technology in Public and Private Organizations in India: A Comparative Study. *Glob. Bus. Rev.* **2020**, *24*, 335–352. [CrossRef]

37. Fuentes, M.; Carcel, J.L.; Dietrich, C.; Yu, L.; Garro, E.; Pauli, V.; Lazarakis, F.I.; Grondalen, O.; Bulakci, O.; Yu, J.; et al. 5G New Radio Evaluation Against IMT-2020 Key Performance Indicators. *IEEE Access* **2020**, *8*, 110880–110896. [CrossRef]

38. Luo, Y. New connectivity in the fragmented world. *J. Int. Bus. Stud.* **2022**, *53*, 962–980. [CrossRef]

39. Choudhury, P.; Foroughi, C.; Larson, B. Work-fromanywhere: The productivity effects of geographic flexibility. *Strateg. Manag. J.* **2021**, *42*, 655–683. [CrossRef]

40. Salemink, K.; Strijker, D.; Bosworth, G. Rural development in the digital age: A systematic literature review on unequal ICT availability, adoption, and use in rural areas. *J. Rural Stud.* **2017**, *54*, 360–371. [CrossRef]

41. Morris, J.; Morris, W.; Bowen, R. Implications of the digital divide on rural SME resilience. *J. Rural Stud.* **2022**, *89*, 369–377. [CrossRef]

42. Palmer-Abbs, M.; Cottrill, C.; Farrington, J. The digital lottery: The impact of next generation broadband on rural small and micro businesses in the North East of Scotland. *J. Rural Stud.* **2021**, *81*, 99–115. [CrossRef]

43. Castellani, D.; Lavoratori, K.; Perri, A.; Scalera, V.G. International connectivity and the location of MNE knowledge-intensive activities. *Glob. Strategy J.* **2021**, *12*, 82–107. [CrossRef]

44. Nambisan, S.; Luo, Y. Toward a loose coupling view of digital globalization. *J. Int. Bus. Stud.* **2021**, *52*, 1646–1663. [CrossRef]

45. Ritter, T.; Pedersen, C.L. Digitization capability and the digitalization of business models in business-to-business firms: Past, present, and future. *Ind. Mark. Manag.* **2020**, *86*, 180–190. [CrossRef]

46. Lei, S. Modeling an web community discovery method with web page attraction. *J. Intell. Fuzzy Syst.* **2021**, *40*, 11159–11169. [CrossRef]

47. Mayliana, G.; Chumaidiyah, E.; Suryono, J.E.; Salsabila, G.; Yenny. Investment Website: A Way to Increase Local Investors for Indonesian Economy. In Proceedings of the 4th International Conference on Management Engineering, Software Engineering and Service (ICMSS 2020), Wuhan, China, 17–19 January 2020; pp. 135–139. [CrossRef]

48. Thongmak, M. Website quality and company's market value: An exploration of SMEs and large firms in the Stock Exchange of Thailand. *Meas. Bus. Excell.* **2022**, *26*, 508–523. [CrossRef]

49. Uysal, N. On the relationship between dialogic communication and corporate social performance: Advancing dialogic theory and research. *J. Public Relat. Res.* **2018**, *30*, 100–114. [CrossRef]

50. Jaini, A.; Dahlan, J.M.; Suhadak, N.; Zainuddin, N.A. Leveraging Digital Marketing to Empower SME Competency: A Conceptual Paper. In *Impact of Artificial Intelligence, and the Fourth Industrial Revolution on Business Success. ICBT 2021. Lecture Notes in Networks and Systems*; Alareeni, B., Hamdan, A., Eds.; Springer: Cham, Switzerland, 2023; Volume 485. [CrossRef]

51. Lanyi, B.; Hornyak, M.; Kruzslicz, F. The effect of online activity on SMEs' competitiveness. *Compet. Rev.* **2021**, *31*, 477–496. [CrossRef]

52. Dolega, L.; Rowe, F.; Branagan, E. Going digital? The impact of social media marketing on retail website traffic, orders and sales. *J. Retail. Consum. Serv.* **2021**, *60*, 102501. [CrossRef]

53. Lock, I.; Araujo, T. Visualizing the triple bottom line: A large-scale automated visual content analysis of European corporations' website and social media images. *Corp. Soc. Responsib. Environ. Manag.* **2020**, *27*, 2631–2641. [CrossRef]

54. Troise, C.; Camilleri, M.A. The Use of Digital Media for Marketing, CSR Communication and Stakeholder Engagement. In *Strategic Corporate Communication in the Digital Age*; Camilleri, M.A., Ed.; Emerald Publishing Limited: Bingley, UK, 2021; pp. 161–174. [CrossRef]

55. Yao, J.; Li, X. SMEs' Entrepreneurship from the Perspective of Social Networks. In Proceedings of the International Conference on E-Business (WHICEB 2020), Wuhan, China, 5 July 2020; pp. 483–490.

56. Adiandari, A.M. Financial performance innovation since digital technology entered Indonesian MSMEs. *Int. J. Appl. Inf. Manag.* **2022**, *2*, 50–58.

57. Algharabat, R.S.; Rana, N.P. Social commerce in emerging markets and its impact on online community engagement. *Inf. Syst. Front.* **2021**, *23*, 1499–1520. [CrossRef]

58. Zheng, X.; Men, J.; Xiang, L.; Yang, F. Role of technology attraction and parasocial interaction in social shopping websites. *Int. J. Inf. Manag.* **2020**, *51*, 102043. [CrossRef]

59. Hariguna, T.; Sukmana, H.T.; Kim, J.I. Survey opinion using sentiment analysis. *J. Appl. Data Sci.* **2020**, *1*, 35–40. [CrossRef]

60. Pineiro-Chousa, J.; Lopez-Cabarcos, M.A.; Ribeiro-Soriano, D. The influence of financial features and country characteristics on B2B ICOs' website traffic. *Int. J. Inf. Manag.* **2021**, *59*, 102332. [CrossRef]

61. Webster, G.B.; Imam, T.; White, C. How Australian SMEs engage social media as digital touchpoints—A content analysis. *Small Enterp. Res.* **2021**, *28*, 170–189. [CrossRef]

62. Pasko, O.; Chen, F.; Oriekhova, A.; Brychko, A.; Shalyhina, I. Mapping the literature on sustainability reporting: A bibliometric analysis grounded in Scopus and Web of Science core collection. *Eur. J. Sustain. Dev.* **2021**, *10*, 303–322. [CrossRef]

63. Bhatti, A.; Akram, H. Moderating role of subjective norms between online shopping behaviour and its determinants. *Int. J. Soc. Sci. Econ. Rev.* **2020**, *2*, 1–9. [CrossRef]

64. Bordeleau, F.E.; Mosconi, E.; De Santa-Eulalia, L.A. Business intelligence and analytics value creation in Industry 4.0: A multiple case study in manufacturing medium enterprises. *Prod. Plan. Control* **2020**, *31*, 173–185. [CrossRef]

65. Gonçalves, M.J.A.; da Silva, A.C.F.; Ferreira, C.G. The Future of Accounting: How Will Digital Transformation Impact the Sector? *Informatics* **2022**, *9*, 19. [CrossRef]

66. Yoon, S. A Study on the Transformation of Accounting Based on New Technologies: Evidence from Korea. *Sustainability* **2020**, *12*, 8669. [CrossRef]

67. Chu, M.K.; Yong, K.O. Big Data Analytics for Business Intelligence in Accounting and Audit. *Open J. Soc. Sci.* **2021**, *9*, 42–52. [CrossRef]

68. Damerji, H.; Salimi, A. Mediating effect of use perceptions on technology readiness and adoption of artificial intelligence in accounting. *Account. Educ.* **2021**, *30*, 107–130. [CrossRef]

69. Yüksel, F. Sustainability in Accounting Curriculum of Turkey Higher Education Institutions. *Turk. Online J. Qual. Inq.* **2020**, *11*, 393–416. [CrossRef]

70. Jasim, Y.A.; Raewf, M.B. Information Technology's Impact on the Accounting System. *Cihan Univ.-Erbil J. Humanit. Soc. Sci.* **2020**, *4*, 50–57. [CrossRef]

71. Gladilina, I.; Pankova, L.; Sergeeva, S.; Kolesnik, V. The Effect of Using Information Technologies for Supporting DecisionMaking in the Procurement Management of an Industrial Enterprise on Reducing Financial Costs. *Indian J. Econ. Dev.* **2022**, *18*, 367–373. [CrossRef]

72. Jenab, K.; Staub, S.; Moslehpour, S.; Wu, C. Company performance improvement by quality based intelligent-ERP. *Decis. Sci. Lett.* **2019**, *8*, 151–162. [CrossRef]

73. Dziembek, D. Integrated ERP-Class Management Information Systems—Evolution, Current State and Development Directions. *Probl. Zarz. Manag. Issues* **2021**, *19*, 187–210. [CrossRef]

74. Ruivo, P.; Johansson, B.; Sarker, S.; Oliveira, T. The relationship between ERP capabilities, use, and value. *Comput. Ind.* **2020**, *117*, 103209. [CrossRef]

75. Mohanty, P.K.; Sekhar, S.F.C.; Shahaida, P. Determinants of ERP Adoption, User Satisfaction, and User Engagement. *Int. J. Inf. Syst. Model. Des.* **2022**, *13*, 44. [CrossRef]

76. Costa, C.J.; Aparicio, M.; Raposo, J. Determinants of the management learning performance in ERP context. *Heliyon* **2020**, *6*, E03689. [CrossRef]

77. Kitsantas, T. Exploring Blockchain Technology and Enterprise Resource Planning System: Business and Technical Aspects, Current Problems, and Future Perspectives. *Sustainability* **2022**, *14*, 7633. [CrossRef]

78. Moosavi, J.; Naeni, L.M.; Fathollahi-Fard, A.M.; Fiore, U. Blockchain in supply chain management: A review, bibliometric, and network analysis. *Environ. Sci. Pollut. Res.* **2021**, *23*, 68. [CrossRef]

79. Manupati, V.K.; Schoenherr, T.; Ramkumar, M.; Wagner, S.M.; Pabba, S.K.; Singh, R.I.R. A blockchain-based approach for a multi-echelon sustainable supply chain. *Int. J. Prod. Res.* **2020**, *58*, 2222–2241. [CrossRef]

80. Bellon, M.; Dabla-Norris, E.; Khalid, S.; Lima, F. Digitalization to improve tax compliance: Evidence from VAT e-Invoicing in Peru. *J. Public Econ.* **2022**, *210*, 104661. [CrossRef]

81. Fan, X.; Deng, N.; Qian, Y.; Dong, X. Factors affecting the efectiveness of Cause-Related Marketing: A meta-analysis. *J. Bus. Ethics* **2022**, *175*, 339–360. [CrossRef]

82. Kang, J.; Diao, Z.; Zanini, M.T. Business-to-business marketing responses to COVID-19 crisis: A business process perspective. *Mark. Intell. Plan.* **2021**, *39*, 454–468. [CrossRef]

83. Donthu, N.; Gustafsson, A. Effects of COVID-19 on business and research. *J. Bus. Res.* **2020**, *117*, 284–289. [CrossRef]

84. Bhatti, H.Y.; Galan-Ladero, M.M.; Galera-Casquet, C. Cause-related marketing: A systematic review of the literature. *Int. Rev. Public Nonprofit Mark.* **2022**, *20*, 25–64. [CrossRef]

85. Das, N.; McNeil, C.; Pouder, R.W.; Daly, J.P. Is cause-related marketing a winning strategy? An event study analysis. *J. Mark. Theory Pract.* **2020**, *28*, 43–55. [CrossRef]

86. Deb, M.; Sharma, V.K.; Amawate, V. CRM, Skepticism and Patronage Intention—The mediating and moderating role of satisfaction and religiosity. *J. Strateg. Mark.* **2021**, *29*, 316–336. [CrossRef]

87. Rego, M.M.; Hamilton, M.A.; Rogers, D. Measuring the impact of Cause-Related Marketing: A meta-analysis of nonproft and for-proft alliance campaigns. *J. Nonprofit Public Sect. Mark.* **2021**, *33*, 434–456. [CrossRef]

88. Silva, S.C.; Duarte, P.; Marinho, A.F.L.; Vlačić, B. How permeable to cause-related marketing are millennials? *Int. Rev. Public Nonprofit Mark.* **2021**, *18*, 335–360. [CrossRef]

89. Roggeveen, A.L.; Beitelspacher, L. Understanding and implementing CRM initiatives in international markets. *Int. Mark. Rev.* **2020**, *37*, 735–746. [CrossRef]

90. Cosgrave, D.; O'Dwyer, M. Ethical standards and perceptions of CRM among millennial consumers. *Int. Mark. Rev.* **2020**, *37*, 863–884. [CrossRef]

91. Panasenko, S.V.; Cheglov, V.P.; Ramazanov, I.A.; Krasil'nikova, E.A.; Sharonin, P.N. Mechanisms of e-commerce enterprises development in the context of digitalization. *Nexo Rev. Cient.* **2021**, *34*, 469–476. [CrossRef]

92. Fouskas, K.; Pachni-Tsitiridou, O.; Chatziharisto, C. A Systematic Literature Review on E-Commerce Success Factors. In *Strategic Innovative Marketing and Tourism. Springer Proceedings in Business and Economics*; Kavoura, A., Kefallonitis, E., Theodoridis, P., Eds.; Springer: Cham, Switzerland, 2020. [CrossRef]

93. Chesbrough, H. To recover faster from Covid-19, open up: Managerial implications from an open innovation perspective. *Ind. Mark. Manag.* **2020**, *88*, 410–413. [CrossRef]

94. Nenonen, S.; Storbacka, K. Don't adapt, shape! Use the crisis to shape your minimum viable system—And the wider market. *Ind. Mark. Manag.* **2020**, *88*, 265–271. [CrossRef]

95. Nurcahyo, R.; Putra, P.A. Critical Factors in Indonesia's E-Commerce Collaboration. *J. Theor. Appl. Electron. Commer. Res.* **2021**, *16*, 2458–2469. [CrossRef]

96. Jeansson, J.; Nikou, S.; Lundqvist, S.; Marcusson, L.; Sell, A.; Walden, P. SMEs' online channel expansion: Value creating activities. *Electron. Mark.* **2017**, *27*, 49–66. [CrossRef]

97. Veeragandham, M.; Patnaik, N.; Tiruvaipati, R.; Guruprasad, M. Consumer buying behavior towards E-Commerce during COVID-19. *Int. J. Res. Eng. Sci. Manag.* **2020**, *3*, 78–82. [CrossRef]

98. Badr, A.M.N.A.A.; Mohamed, T.I.; Osman, N.A.Q.; Mikhaylov, A. Review of Social Media Website Users' Interaction Paths with Governmental Accounts during the COVID-19 Pandemic. *Informatics* **2022**, *9*, 50. [CrossRef]

99. Abubakr, M.; Kaya, T. A Comparison of e-government systems between developed and developing countries: Selective insights from Iraq and Finland. *Int. J. Electron. Gov. Res.* **2021**, *17*, 14. [CrossRef]

100. Apriliyanti, I.D.; Kusumasari, B.; Pramusinto, A.; Setianto, W.A. Digital divide in ASEAN member states: Analyzing the critical factors for successful e-government programs. *Online Inf. Rev.* **2021**, *45*, 440–460. [CrossRef]

101. Mensah, I.K.; Mwakapesa, D.S. The impact of e-government information quality (EGIQ) dimensions on the adoption of electronic government services. *Inf. Dev.* **2023**, 5164. [CrossRef]

102. Krishna, B.; Sebastian, M.P. Examining the relationship between e-government development, nation's cyber-security commitment, business usage and economic prosperity: A cross-country analysis. *Inf. Comput. Secur.* **2021**, *29*, 737–760. [CrossRef]

103. Duraskovic, J.; Viduka, D.; Gajic-Glamoclija, M. The Use of E-government from the Perspective of Biggest Business Entities in Serbia. *J. Inf. Organ. Sci.* **2021**, *45*, 39–53. [CrossRef]

104. Ha, L.T.; Huyen, N.T.T. Is the E-Government a Driver of Financialization: Empirical Evidence from European Countries. *Glob. Econ. J.* **2021**, *21*, 2150017. [CrossRef]

105. Altin, M.; Yilmaz, R. Adoption of Cloud-Based Accounting Practices in Turkey: An Empirical Study. *Int. J. Public Adm.* **2022**, *45*, 819–833. [CrossRef]

106. Hamundu, F.M.; Husin, M.H.; Baharudin, A.S.; Khaleel, M. Intention to adopt cloud accounting: A conceptual model from Indonesian MSMEs perspectives. *J. Asian Financ. Econ. Bus.* **2020**, *7*, 749–759. [CrossRef]

107. Khayer, A.; Bao, Y.; Nguyen, B. Understanding cloud computing success and its impact on firm performance: An integrated approach. *Ind. Manag. Data Syst.* **2020**, *120*, 963–985. [CrossRef]

108. Yau-Yeung, D.; Yigitbasioglu, O.; Green, P. Cloud accounting risks and mitigation strategies: Evidence from Australia. *Account. Forum* **2020**, *44*, 421–446. [CrossRef]

109. Moll, J.; Yigitbasioglu, O. The role of internet-related technologies in shaping the work of accountants: New directions for accounting research. *Br. Account. Rev.* **2019**, *51*, 100833. [CrossRef]

110. Demirkan, S.; Demirkan, I.; McKee, A. Blockchain technology in the future of business cyber security and accounting. *J. Manag. Anal.* **2020**, *7*, 189–208. [CrossRef]

111. Rao, M.T.; Jyotsna, T.G.; Sivani, M.A. Impact of cloud accounting: Accounting professional's perspective. *IOSR J. Bus. Manag.* **2017**, *7*, 53–59. Available online: https://iosrjournals.org/iosr-jbm/papers/Conf.17037-2017/Volume-7/11.%2053-59.pdf (accessed on 15 January 2023).

112. Kroon, N.; Alves, M.d.C.; Martins, I. The Impacts of Emerging Technologies on Accountants' Role and Skills: Connecting to Open Innovation—A Systematic Literature Review. *J. Open Innov. Technol. Mark. Complex.* **2021**, *7*, 163. [CrossRef]

113. Pedersen, C.L.; Ritter, T. Preparing your business for a post-pandemic world. *Harv. Bus. Rev. Digit. Artic.* **2020**. Available online: https://hbr.org/2020/04/preparing-your-business-for-a-post-pandemic-world (accessed on 15 January 2023).

114. Tettamanzi, P.; Venturini, G.; Murgolo, M. Sustainability and Financial Accounting: A Critical Review on the ESG Dynamics. *Environ. Sci. Pollut. Res.* **2022**, *29*, 16758–16761. [CrossRef] [PubMed]

115. Schaltegger, S. Unsustainability as a key source of epi- and pandemics: Conclusions for sustainability and ecosystems accounting. *J. Account. Org. Chang.* **2020**, *16*, 613–619. [CrossRef]

116. Di Vaio, A.; Hasan, S.; Palladino, R.; Hassan, R. The transition towards circular economy and waste within accounting and accountability models: A systematic literature review and conceptual framework. *Environ. Dev. Sustain.* **2023**, *25*, 734–810. [CrossRef] [PubMed]

117. Niles, K.; Moore, W. Accounting for environmental assets as sovereign wealth funds. *J. Sustain. Financ. Invest.* **2021**, *11*, 62–81. [CrossRef]

118. Tooranloo, H.S.; Shahamabad, M.A. Designing the model of factors affecting in the implementation of social and environmental accounting with the ISM approach. *Int. J. Ethics Syst.* **2020**, *36*, 387–410. [CrossRef]

119. Neumeyer, X.; Liu, M. Managerial competencies and development in the Digital Age. *IEEE Eng. Manag. Rev.* **2021**, *49*, 49–55. [CrossRef]

120. Lamberton, G. Sustainability accounting—A brief history and conceptual framework. *Account. Forum* **2005**, *29*, 7–26. [CrossRef]

121. Santos, S.C.; Neumeyer, X. The Technologization of Entrepreneurial Processes: A Poverty Perspective. *IEEE Trans. Eng. Manag.* **2023**, *70*, 1174–1185. [CrossRef]

122. Tommasetti, A.; Mussari, R.; Maione, G.; Sorrentino, D. Sustainability Accounting and Reporting in the Public Sector: Towards Public Value Co-Creation? *Sustainability* **2020**, *12*, 1909. [CrossRef]

123. Fiandrino, S.; Tonelli, A. A Text-Mining Analysis on the Review of the Non-Financial Reporting Directive: Bringing Value Creation for Stakeholders into Accounting. *Sustainability* **2021**, *13*, 763. [CrossRef]

124. Gil-Marín, M.; Vega-Muñoz, A.; Contreras-Barraza, N.; Salazar-Sepúlveda, G.; Vera-Ruiz, S.; Losada, A.V. Sustainability Accounting Studies: A Metasynthesis. *Sustainability* **2022**, *14*, 9533. [CrossRef]

125. Štefan, B.; Žampa, S. Subsidies and Economic and Financial Performance of Enterprises. *J. Risk Financ. Manag.* **2021**, *14*, 505. [CrossRef]

126. Bai, L.; Yan, X. Impact of social media capability on firm performance: New evidence from China. *Asian Bus. Manag.* **2023**, *22*, 118–136. [CrossRef]

127. Stundziene, A.; Baliute, A. Personnel Costs and Labour Productivity: The Case of European Manufacturing Industry. *Economies* **2022**, *10*, 31. [CrossRef]

128. Ba, Y. Power Dynamics and Corporate Power in Governance Processes: Evidence from US Environmental Governance Systems. *Amer. Rev. Public Adm.* **2021**, *52*, 206–220. [CrossRef]

129. Santa-Maria, T.; Vermeulen, W.J.V.; Baumgartner, R.J. How do incumbent firms innovate their business models for the circular economy? Identifying micro-foundations of dynamic capabilities. *Bus. Strategy Environ.* **2022**, *31*, 1308–1333. [CrossRef]

130. Aguiar, A.P.D.; Collste, D.; Harmackova, Z.V.; Pereira, L.; Selomane, O.; Galafassi, D.; Van Vuuren, D.; Van Der Leeuw, S. Co-designing global target-seeking scenarios: A cross-scale participatory process for capturing multiple perspectives on pathways to sustainability. *Glob. Environ. Chang.* **2020**, *65*, 102198. [CrossRef]

131. Vysochan, O.; Hyk, V.; Vysochan, O.; Olshanska, M. Sustainability Accounting: A Systematic Literature Review and Bibliometric Analysis. *Qual. Access Success* **2021**, *22*, 95–102. [CrossRef]

132. Adhariani, D.; du Toit, E. Readability of sustainability reports: Evidence from Indonesia. *J. Account. Emerg. Econ.* **2020**, *10*, 621–636. [CrossRef]

133. Li, Y.; Dai, J.; Cui, L. The impact of digital technologies on economic and environmental performance in the context of I4.0: A moderated mediation model. *Int. J. Prod. Econ.* **2020**, *229*, 107777. [CrossRef]

134. Lavin, J.F.; Montecinos-Pearce, A.A. ESG Reporting: Empirical Analysis of the Influence of Board Heterogeneity from an Emerging Market. *Sustainability* **2021**, *13*, 3090. [CrossRef]

135. Rahman, R.A.; Alsayegh, M.F. Determinants of Corporate Environment, Social and Governance (ESG) Reporting among Asian Firms. *J. Risk Financ. Manag.* **2021**, *14*, 167. [CrossRef]

136. Zaharova, E.A.; Lihacheva, N.A. Environmental Performance Evaluation of Oil Refineries. *Chem. Technol. Fuels Oils* **2021**, *57*, 482–486. [CrossRef]

137. Russo, A.; Pogutz, S.; Misani, N. Paving the road toward eco-effectiveness: Exploring the link between greenhouse gas emissions and firm performance. *Bus. Strategy Environ.* **2021**, *30*, 3065–3078. [CrossRef]

138. Guastella, G.; Mazzarano, M.; Pareglio, S.; Spani, R.C. Do environmental and emission disclosure affect firms' performance? *Eurasian Bus. Rev.* **2022**, *12*, 695–718. [CrossRef]

139. Berg, F.; Kölbel, J.F.; Rigobon, R. Aggregate confusion: The divergence of ESG ratings. *Forthcom. Rev. Financ.* **2019**, 1–48. [CrossRef]

140. Xie, J.; Nozawa, W.; Yagi, M.; Fujii, H.; Managi, S. Do environmental, social, and governance activities improve corporate fnancial performance? *Bus. Strategy Environ.* **2019**, *28*, 286–300. [CrossRef]

141. Bolton, P.; Kacperczyk, M. Do investors care about carbon risk? National Bureau of Economic Research. *Work. Pap.* **2020**, 26968. [CrossRef]

142. Sohn, J.; Lee, J.; Kim, N. Going green inside and out: Corporate environmental responsibility and fnancial performance under regulatory stringency. *Sustainability* **2020**, *12*, 3850. [CrossRef]

143. Trinks, A.; Mulder, M.; Scholtens, B. An efciency perspective on carbon emissions and fnancial performance. *Ecol. Econ.* **2020**, *175*, 106632. [CrossRef]

144. Eurostat Database. Available online: https://ec.europa.eu/eurostat/databrowser/explore/all/all_themes (accessed on 15 January 2023).

145. Agarwal, R.; Mehrotra, A. SEM approach to understanding m-commerce use in a developing country. *Int. J. Bus. Glob.* **2021**, *27*, 403–423. [CrossRef]

146. Zabukovsek, S.S.; Kalinic, Z.; Bobek, S.; Tominc, P. SEM_ANN based research of factors' impact on extended use of ERP systems. *Cent. Eur. J. Oper. Res.* **2019**, *27*, 703–735. [CrossRef]

147. Ooi, K.B.; Tan, G.W.H. Mobile technology acceptance model: An investigation using mobile users to explore smartphone credit card. *Expert Syst. Appl.* **2016**, *59*, 33–46. [CrossRef]

148. Foo, P.Y.; Lee, V.H.; Tan, G.W.H.; Ooi, K.B. A gateway to realizing sustainability performance via green supply chain man-agement practices: A PLS-ANN approach. *Expert Syst. Appl.* **2018**, *107*, 1–14. [CrossRef]

149. Vărzaru, A.A. An Empirical Framework for Assessment of the Effects of Digital Technologies on Sustainability Accounting and Reporting in the European Union. *Electronics* **2022**, *11*, 3812. [CrossRef]

150. EUR-Lex. Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions the European Green Deal, COM/2019/640 Final. 2019. Available online: https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A52019DC0640 (accessed on 3 February 2023).