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Corporate Social Responsibility

Organizational Strategy for Sustainable Growth

Edited by

Byung Il Park and Shufeng Xiao

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Editorial

Corporate Social Responsibility: Organizational Strategy for Sustainable Growth

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Welcome to the special issue of *Sustainability* on "corporate social responsibility: organizational strategy for sustainable growth." We are delighted to publicize that ten research studies have been selected for publication in the special issue after our in-depth triple-blind review process. We trust that all studies discussed the important discourse on the topic that this special issue pursues. Prior to explaining what the ten studies addressed, a special-issue background is given below:

1. Special Issue Background

Cateora and Graham [1] introduced an interesting management and business case in their book, in which one of the main characters in the case argues the following (p. 634):

> " . . . Things are just done different here. You follow that policy and I guarantee that you'll have fewer sales because our competitors from Germany, Italy, and Japan will pay (bribe). Look, Bill, everybody does it here; it's a way of life . . . the Latinos even pay *mordidas* (i.e., bribe) to other Latinos; it's a fact of life—I think that the circumstances that exist in a country justify and dictate the behavior. Remember man, 'When in Rome, do as the Romans do'".

The short quote above questions whether unethical behavior (corporate irresponsible activities) undertaken by international firms in developing countries is really entirely unethical or simply unavoidable grease, which is necessary in facilitating short-term growth in overseas markets. Both strategic-management and international-business scholars have attempted to examine the outcomes of corporate social responsibility primarily in the organizational strategic aspect. Due to this, they are turning a blind eye to firms' unethical attitudes and are pretending not to notice that it (i.e., unethical behavior) is happening. Current discussions dealing with corporate social responsibility (CSR) have concentrated on solving queries, such as what promotes a firm's citizenship, under which environments firms conduct ethical management, what the primary determinants affecting a certain CSR (e.g., philanthropic CSR) are, and how it strategically enhances corporate performance, but such discussions tend to overlook its effect on long-term sustainable growth.

Thus, we do not yet know enough about CSR from a long-term perspective and its relationship with long-term sustainable growth. We should also acknowledge that a firm's unethical management is a primary cause and a result of poverty in our economy, which means that a firm's irresponsible activities (as an antonym of CSR) cannot be justified by any reason. This also represents the importance of research exploring CSR.

To dig further into CSR *per se*, it can be generally defined as voluntary actions by firms that appear to further some social good, where the activity level is "above and beyond" what is required by law, though current CSR frameworks are various [2]. As discussed above, there is no doubt that being socially responsible is crucial in itself, and organizations must make a sensible decision about the level to which they leverage their CSR activities. Then, they should translate doing good into strategic benefits [3–5]. Through the strategies based on the CSR, firms often move to a situation where they use organizational core

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resources to improve their competitiveness and performance. Considering the treasurable value of CSR, the management research handling the topic is in the limelight and has shown that firms undertaking stronger CSR are usually eligible to attract consumers (in marketing), they commonly fulfill the expectations of investors (in finance), they satisfy internal employees (in management), and they successfully compete against local and global competitors (in strategic international business).

First, as we have sufficiently accumulated CSR research in the different management areas, we believe that this is the time to synthesize diverse research fragments on CSR. Second, we should combine it with an additional unique agenda (e.g., human rights, win-win partnership, and official development assistance), particularly in the sustainability domain, and then compile all theoretical and empirical pieces for organizational sustainability. Thus, by inviting submissions from researchers who study various theoretical perspectives, who adopt various approaches, and who examine at multiple levels of analysis, while including qualitative and quantitative experiments, literature reviews, and meta-analyses, this special issue draws a large picture. In this vein, we are strongly convinced that the studies accepted by this special issue significantly contribute to current relevant debates by filling many extant research gaps. Please see the details below:

2. The Ten Studies Included in This Special Issue

The first article written by Huifang Liu and Jin-Sup Jung identifies key characteristics of corporate social responsibility (CSR) influencing a firm's CSR authenticity. By using regression analyses, the authors uncovered that all three attributes of CSR (i.e., CSR fit, CSR sustainability, and CSR effect) have meaningful relationships with CSR authenticity. However, compared with other attributes, CSR sustainability had relatively marginal associations with CSR authenticity in the Korean sample, whereas the CSR fit did not significantly determine CSR authenticity in the Chinese one. The authors determined the fundamental reason for the different results from different consumer characteristics between the two countries. By contrast, they also detected that the digital transformation of the Fourth Industrial Revolution has strong partial mediating effects between CSR attributes and CSR authenticity. According to them, this result denotes that digital transformation may be an important pathway to obtain CSR authenticity and also indicates that the mediating effect functions as a conduit to a firm's competitiveness.

The second article authored by Arnold Bernaciak, Małgorzata Halaburda, and Anna Bernaciak sought to answer what motivates, retards, and determines a firm's CSR in the context of the Polish construction sector. In addition, this study also attempted to explore the effects of firm size (i.e., large, medium, and small) on the issue illustrated above. The authors explained the importance of their examination by determining that the construction industry has a considerable effect on the environment and people, uses an enormous volume of natural resources, generates polluted materials, and mass produces large amounts of waste. Moreover, CSR is a vital agenda in that construction sites are a place of danger and accidents. Based on the triangulation method, the study discovered the presence of large variations with respect to motives, barriers, and expected benefits out of the execution of CSR principles. Their findings also revealed that the practice of CSR principles is often affected by a firm's various considerations and situations. That is, it may be difficult to assert that a certain factor clearly determines the CSR activities. The results achieved may indicate a useful implication for decision-makers at the management level and for legislation, thus regulating better conditions for the development of CSR in the sector.

Kum-Sik Oh, Juyeon Rachel Han, and So Ra Park, who authored the third article, attempted to examine the relationships among the employees' perception of CSR, their intrinsic motivations, and their organizational commitment in the hotel industry. In addition, they also explored (1) the mediating effect of intrinsic motivation on the association between the employees' perception of customer- and employee-related CSR and organizational commitment, and they tested (2) the moderating role of job level on the relationship

between CSR perceptions and intrinsic motivation. According to the results obtained from quantitative analyses, they uncovered that (1) both types of CSR perceptions are crucial in fostering intrinsic motivation and organizational commitment; (2) intrinsic motivation improves organizational commitment; and (3) the link between employee CSR perceptions and intrinsic motivation is positively moderated by job level. Another interesting result detected by them is that the level of intrinsic motivation will be considerably different between managerial and non-managerial employees in the case where customer-related CSR or employee-related CSR is high. Such findings may be useful for human-resource departments, in which CSR practices can be a means to enhance employee intrinsic motivation and organizational commitment.

The main objective of the fourth study by Mengmeng Wang and Xue Fan was to analyze the fitness between live streaming e-commerce and green agrifood. To answer the question of how livestreaming can contribute to the sustainability of green agri-food entrepreneurial firms, the theory of a task–technology fit was employed. The authors collected the data through a web-based questionnaire and obtained them from a sample of 574 green agri-food entrepreneurial firms. Then, they ran a structural-equation-modeling (SEM) analysis and determined a positive effect of the locality and eco-friendliness of green agri-food, the responsiveness, interactivity, and entertainment of livestreaming e-commerce on the fit of green agri-food livestreaming e-commerce. Furthermore, their results demonstrated that the fit of green agri-food livestreaming has a positive effect on firm performance and the intention to adopt livestreaming e-commerce. The study also shows the moderating effect of perceived CSR on the relationship between the fit of livestreaming of green agri-food and the intention to adopt livestreaming e-commerce. Their findings are valuable because they provide useful insights into the successful adoption of livestreaming e-commerce.

The fifth study written by Xiaoyan Pan, Kum-Sik Oh, and Mengmeng Wang started developing the idea that strategic orientation represents an essential antecedent condition for new product development (NPD) performance, which can be a vehicle for firms to improve their competitive advantage and enlarge sustainable growth. Under this premise, the study investigated how strategic orientation (i.e., technology orientation and customer orientation) promotes a firm's digital capabilities and NPD performance in the context of digital transformation. Using a resource-based view and its extended dynamic capabilities as an overarching theoretical lens, it tried to solve the doubt. Their analyses from SEM shed light on the roles of technology orientation and customer orientation and revealed that both factors can be instrumental in driving a firm's digital capabilities (if we compare the influential powers of the two factors, technology orientation plays a more pivotal role than customer orientation in contributing to NPD performance). Moreover, their experiment also confirmed the moderating effect of CSR on the relationship between strategic orientation and NPD performance. It provides an important insight into non-market mechanisms and emphasizes that firms can compensate for their strategically-oriented practices through CSR in the NPD process.

The sixth article by two authors (i.e., Boine Kim and Byoung-Goo Kim) noted that extant empirics investigating the outcomes of the venture firms' CSR initiatives are scant. In this vein, it aimed to analyze the factors influencing their performance and indicated that both financial and non-financial firm growth is an end product of CSR activities. From statistical analyses on data collected from Korean venture firms, the message given by the study is clear. That is, according to the results yielded by step-wise regression analyses, it determined that the number of CSR types (e.g., donation, talent donation, community service, creating shared value, sponsorship, etc.) in which firms participate is a crucial determinant promoting organizational development. From the results, the authors argued that firms do not only need to conduct CSR but also should sincerely try to diversify ethical endeavors.

The seventh study was another empirical study conducted by Bu-Kyung Choi, Ji-Young Ahn, and Myeong-Cheol Choi. They examined the economic effect of CSR initiatives on corporate innovation, and Korean firms were employed for the investigation. The main

objective of the study was that the authors attempted to explain how a CEO compensation system can affect the CSR–innovation relationship. To solve their curiosity, they developed an integrated model exploring the effect of CSR on innovation activities through analyzing various factors comprising CEO compensation schemes (e.g., structure, type, mix, and distribution). Using longitudinal data, the empirical study yielded the following results. First, CSR can ignite innovation activities. Second, in the case where the proportion of performance-based pay to total compensation is great, the positive connection between CSR and innovation activities is strengthened. Third, the evidence on the potential alignment between CSR and the intensity of stock-based pay is unclear. Fourth, the wage gap between the CEO and the top management team undermines the positive effect of CSR on innovation activities. Based on the empirical outcomes, this study provides important insights into the CSR–innovation relationship.

Another experiment undertaken by Xinyuan Wang, Zhenyang Zhang, and Dongphil Chun scrutinized the potential connection among internal control effectiveness, CSR, and technological innovation. The eighth study employed the data of Chinese A-share-listed firms between 2014 and 2019 as its sample. The important discoveries achieved by the study are threefold. First, the internal control effectiveness was significantly and positively associated with technological innovation. Second, the betterment of internal control effectiveness had a significant and positive influence on CSR performance. Third, CSR plays a partial mediating role in linking internal control effectiveness and technological innovation. These findings indicated that internal control effectiveness can be a vehicle to promote technological innovation through the transmission mechanism of CSR.

The aim of the ninth article, which was written by Mengmeng Wang and Wenjie Yang, was to depict a large picture that may help better understand what determines rural consumers' positive attitudes on e-commerce and how it can improve their willingness to adopt it. In contrast with other studies, which are primarily based on quantitative techniques, this study, as a first step, used a qualitative interview-based experiment of 104 rural consumers to test the framework designed. According to the authors' arguments, these practices are suitable in identifying new problems or challenges often encountered by rural consumers in impoverished areas after several years of experience in e-commerce. Posterior to the qualitative attempt, this study also conducted additional quantitative tests to further examine the effects of service quality and cultural context. A total of 434 rural consumers in relatively underdeveloped areas of China are participated in the survey. The SEM results of this study exhibited a positive association between logistics and training service quality, subjective norms, self-efficiency sense, and the rural consumers' attitudes toward e-commerce platforms, respectively. The authors insisted that the confirmed relationship above indicated the consumers' positive intent to engage in word-of-mouth e-commerce promotion. Moreover, the study also revealed the positive moderating effects of CSR on logistics and training services, subjective norms, and attitudes toward the use of e-commerce platforms. The discoveries from these two studies provided practical implications and significantly contributed to both CSR and e-commerce literatures.

The final study by Márcia Machado and Tereza Carvalho was based on exploratory research navigating the academic databases of Web of Science, IEEE, Scopus, and Google Scholar to identify works that address sustainability and other relevant concepts. This process was conducted to examine the association between control objectives for information and related technologies (COBIT) maturity models adopted by information technology (IT) firms and the sustainability indicators. In other words, this study sought to develop a series of sustainable indicators, which can be adopted by small- and medium-sized software firms, and investigated the relationship between those indicators and the COBIT maturity model. The authors indicated that this set of indicators can be the essential foundations for CSR and environmental, social, and corporate governance (ESG). In particular, in the perspectives of ESG, the authors uncovered that the environmental and social indicators have a closer connection with the COBIT model than others (e.g., economic indicators). Moreover, the authors also highlighted that governance often functions as a strategic mechanism

that controls the balance of activities and facilitates the adequate use of organizational resources. Thus, the mechanism comprising governance has a propensity to improve corporate performance and efficiency.

The guest editors noted that the authors, who submitted to the special issue, commonly provided the criticism that although CSR has been considered as a critical issue for marketers, managers, and top management the concept has been only recently attracting scholarly attention. Due to the problem, many issues on CSR have been veiled, and many extant studies have not been adequately rooted in theoretical basis. Although we acknowledged some of the exceptions, previous studies tended to use a few theoretical lenses, such as stakeholder theory and institutional-based view, which implies that others are considerably neglected in the empirical investigations. Moreover, the authors also pointed out that the current studies face massive methodological problems. Many scholars have generally endeavored to improve the sophistication and rigor, but researchers still experience serious research gaps in domains such as diversifications in methodological skills, geographical territory, sampling characteristics, and the point of view observing the phenomenon.

We hope that the wide range of gaps illustrated above are cemented by our special issue, and we want to leave some residual agendas as future research avenues on CSR and sustainability strategies. The guest editors would like to thank all reviewers and all those who contributed their studies to the special issue. The guest editors especially passed our gratitude to Nina Tian, who has substantially supported the special issue as an assistant manager. We believe that this special issue could not have been brought to this stage without their generosity and sincere efforts. Again, we wish to give our many thanks to all of them.

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Article

The Effect of CSR Attributes on CSR Authenticity: Focusing on Mediating Effects of Digital Transformation

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Abstract: What corporate social responsibility (CSR) attributes determine the CSR authenticity of a company? In the face of the Fourth Industrial Revolution, what direction should the CSR strategy pursue? In the electronics industries in Korea and China, are there any differences in CSR attributes? In this study, we start with some of these basic questions. Considering the promotional and actual costs incurred from CSR activities, CSR strategy are not an issue that can be easily determined from the corporate perspective. However, now it is essential for companies to carry out CSR and sustainable development goals (SDGs) activities, and businesses cannot overlook social issues either. Companies cannot pursue only growth through corporate interests without social value. In this study, we derive three attributes of CSR fit, CSR sustainability, and CSR impact to verify the authenticity of CSR activities. Moreover, we demonstrated the impact of these three attributes on CSR authenticity for the electronics industries in Korea and China. As a result of empirical testing, most of three attributes above mentioned (i.e., CSR fit, CSR sustainability, and CSR impact) produce meaningful results for CSR authenticity. However, CSR sustainability was rejected for the Korea sample, and CSR fit was rejected for the Chinese sample, showing some differences between the two countries. Meanwhile, the digital transformation of the Fourth Industrial Revolution had strong partial mediating effects between CSR attributes and CSR authenticity. This means that digital transformation can be an important pathway to achieve CSR authenticity and suggests that important mediating effects can eventually lead to a firm's competitiveness.

Keywords: Fourth Industrial Revolution; CSR authenticity; digital transformation; mediating effect; China; Korea

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1. Introduction

The Fourth Industrial Revolution (FIR) and COVID-19 pandemic are accelerating the creation of new business environments. In addition, in this new era, stakeholders demand greater amounts of corporate social responsibility (CSR) activities than in the past [1,2]. In addition, the FIR and COVID-19 pandemic are expected to bring about greater social change in the near future. Due to these reasons, most companies now feel the need to actively participate in social responsibility activities, recognizing them as an essential component of management activities. In particular, there is increased interest in effective CSR strategies that can draw consumers' interest and participation in management strategies and marketing [3–5].

Corporate CSR activities have played a pivotal role in positively changing consumer perceptions in the face of corporate crises and have evolved into an important element of corporate competitiveness [6–8]. As such, consumer awareness of CSR activities and CSR participation continue to increase, while some studies show that consumer assessment of corporate CSR activities is not positive. Moreover, CSR is often recognized as a short-term marketing activity to enhance the company's image, and skepticism exists about whether CSR truly contributes to society. In other words, if we believe that an entity is engaged in CSR activities for short-term profit, we are skeptical of the entity's CSR activities and, as a

result, we have a negative assessment of CSR activities [9]. Therefore, in order to study the effectiveness of CSR activities, factor such as the sustainability of CSR need to be addressed, which is an issue of whether CSR activities are performed consistently [10].

One of the major research topics in CSR-related research is the "fit" that shows similarities between CSR activities and the company's core products and services [11]. This "fit" is one of the key factors in determining the effectiveness of CSR activities, with many studies focusing on related issues [12,13]. The literature has identified important factors of CSR authenticity (CA). Moreover, CA has proven to have a positive impact on consumers' overall perception of CSR activities [14].

"CSR fit" (CF) is the extent to which an entity's stakeholders recognize the relationship between the company and its CSR activities. On the other hand, "CA" indicates that an entity performs CSR activities for the benefit of the society. CA refers to consumers' actual trust in CSR behavior [15] and is an important factor in influencing the evaluation of CSR activities [14,16]. Especially, the attributes of CSR activities were divided into economic, legal, ethical, and discretionary responsibilities based on the study of Carroll (1979) [17]. This study selected and analyzed attributes of CSR activities that included CF, CSR sustainability (CS), and CSR impact (CI). Therefore, in this study, we define the attributes of enterprise activities as CSR characteristics that emerge when an enterprise performs CSR activities. For example, typical characteristics of CSR activities are that they consistently perform social responsibilities, have a great effect on social problem solving, or that they match with the corporate image.

In the digital age, CSR and digital transformation (DT) are becoming critical factors of a company's competitiveness [18]. Especially, DT is the most important element of the FIR, changing the way business is performed [19]. The FIR is affecting the overall industrial structure by reducing transaction costs due to the digital economy and meeting customized consumption trends [20]. Because the way business is conducted is affected by environmental, social, and economic trends, DT affects the sustainability of business models [21]. Naturally, it also plays an important role not only in the company's business model but also in the company's performance of social responsibility. For example, in some companies, the big data analysis of existing patents on social problems that are closely related to people's lives can diagnose problems and derive technical solutions.

Therefore, this study aims to achieve the following. First, this study explores the attributes of CSR activities based on the relevant existing research, which was divided into three main categories: CF, CS, and CI. We also examine the impact of these attributes on the authenticity of CSR. Second, we consider the "mediating effect of DT" between these attributes and CA. It is believed that this research model will not only provide important insights for future CSR strategies but also contribute to the theoretical foundation of CSR activities in response to the FIR.

Subsequently, this study was conducted as follows. In the following section, we discuss the theory of the major variables associated with this research model, including the attributes of CSR, the authenticity of CSR, and DT. The next section presents our research model by establishing our hypotheses. In Section 4, we carry out the empirical analysis. Finally, in Sections 5 and 6, we summarize our findings and suggest valuable implications.

2. Literature Review

CSR activities not only involve corporate social contributions but are also considered strategic elements of a company's sustainable growth and are recognized as essential for corporate management activities [1]. The most commonly used definition of organizing and explaining the concept of CSR is the definition of Carroll (1979) [17]. He divided attributes of the overall CSR activities into more detailed economic, legal, ethical, and discretionary responsibilities. He also argued that these four attributes of CSR activities form a hierarchical pyramid from lower-level economic responsibility to higher-level discretionary responsibility. In general, strategic CSR activities that efficiently use limited resources to establish a virtuous cycle between economic performance and social contributions are

insufficient. Consequently, reflecting this reality, one of the important areas of CSR research is exploring the attributes of CSR activities that determine performance [22]. Therefore, we also want to focus on the main attributes of CSR activities and performance.

2.1. Attributes of CSR

Attributes of CSR are the factors associated with the attributes of CSR activities themselves. Existing studies involving antecedent variables of CSR authenticity show that the attributes of CSR activities will have a positive impact on CA [23]. Existing studies related to CA show that the attributes of CSR activities will have a positive effect on CA [1,24]. In a study by An, Seo, and Lee [25], three attributes of CF, CSR consistency, and CI, were selected as components of CA. Their research target was a franchise company and considered the impact of CSR activities at franchise headquarters on franchisees' perceptions. Beckman and Colwell [14] have derived seven variables that affect CA, including relevance, transparency, impact, and consistency. In our study, we define attributes of corporate activities as CSR features that appear when companies perform CSR activities, and we hope to use these CSR features when verifying the effectiveness of CSR activities. Based on these prior studies, this study aims to distinguish attributes of CSR activities into three main categories of CF, CS, and CI. We will now discuss these categories in greater detail.

2.1.1. CSR Sustainability (CS)

CS is the possibility that CSR activities can be maintained continuously through "persistence" and "consistency". In this regard, "consistency" is one of the main variables in determining motives and whether a particular behavior or attitude of the target is maintained from beginning to end. This attribute is a concept that many CSR studies have also noted [22,26–28]. While consistent information usually leads to a positive response by reducing consumers' efforts to refine and explore information, inconsistent information leads to confusion and antagonizes existing information, resulting in a negative response.

Sustainability presented in this study relates to "keeping CSR activities consistent" (systematically aligned with the overall firm's strategy) with an entity's resource commitment, objectives, and performance tactics from start to finish "continuously". In other words, for CS activities, "continuously" includes the cost, resources, and time invested by an entity are consistent and consistently in accordance with the corporate strategy [25,29,30]. Ellen, Webb, and Mohr [31] argued that experimental research has a positive impact only if consumers recognize persistence in the CSR activities of a target entity.

2.1.2. CSR Fit (CF)

In order to carry out CSR more strategically, it is necessary to examine the fit of social contribution activities [1,9]. The fit of CSR activities is valued when consumers recognize the comprehensive activities of an enterprise (e.g., business or product line, corporate image, market positioning, target market, corporate mission). CF is the perceived conformity between the attributes of the enterprise and CSR activities [32]. Ellen, Webb, and Mohr [31] defined "fit" in cause marketing as "a recognized link among the company's product line, brand image, brand positioning, or target market". They demonstrated that fit between businesses and CSR activities is a key factor in successful CSR and showed that a higher CF makes consumer evaluations more positive. Pracejus and Olsen [33] suggested that the public appreciates the value of a company's contribution if the company's contribution activities are more consistent with its nature. This is because the more social contribution activities of companies align with corporate characteristics, the more favorable they are to consumers. Therefore, in the CSR literature, CF is a relational relationship between the attributes of the enterprise and the CSR activities it implements [34].

2.1.3. CSR Impact (CI)

"CI" refers to the extent to which CSR activities have substantially resulted in the resolution of social problems [35]. In other words, CI refers to the importance of the social

problem that the company intends to support and the recognition of the degree to which the CSR activity contributes substantially to the resolution of the social problems [36]. Bae [37] defined CI as "a way to express how positive social contribution activities in question bring positive benefits to society or beneficiaries". In addition, emphasizing the social impact of an enterprise's CSR commitment or CSR efforts is an effective communication strategy because CSR communication should be realistic and avoid the impression of "bragging" [38].

Positive effects of CSR activities include improved image and attitude toward companies that perform CSR, improved stakeholder satisfaction, enhanced buffer against corporate crises, increased future acquisition of potential customers or employees, increased likelihood of companies and products, and increased purchase intentions [39–41]. According to Alhouti et al. [36], CI has a positive effect on CA. Holbrook [42] shows that the greater the CI, the more likely it is to interpret CA as altruistically motivated activities.

2.2. Authenticity of CSR (CA)

Most studies on CA have shown that the evaluation of CSR activities has been treated as important variables, especially with regard to negative perceptions such as commercial intentions [12,43].

Price, Arnould, and Tierney [44] found that authenticity is not done because of social obligations or responsibilities but with genuine consideration for others. Many studies of authenticity have also been conducted in the CSR research, which state that authenticity is present when the internal motivation for CSR activities matches external behaviors [45].

The authenticity of CSR activities is related to whether a company acts honestly by showing its sincerity to consumers throughout the entire process of CSR marketing activities, explaining whether a company's social contribution activities are genuine activities to solve social and environmental problems [12,43]. CA is the subjective and overall assessment of how truthful a company is and is seen as the basis for determining how sincere and responsible CSR activities are perceived by consumers [46].

If CSR activities are perceived as being purely motivated for social contribution, they are judged to be genuine acts, resulting in favorable responses toward the company as well as the act itself [31,38]. On the other hand, activities derived from the purpose of seeking profit may be assessed as lacking sincerity, resulting in a negative response.

2.3. Digital Transformation (DT) in the Era of the Fourth Industrial Revolution

The FIR has brought about massive changes in industry as well as society with the advent of new business models and the destruction of existing systems, production and consumption patterns, and transportation and delivery systems [47]. Companies are innovating existing services by combining their products with various information and communication technologies (ICTs), such as the internet of things (IoT), artificial intelligence (AI), and big data. All of these actions are called "digital transformation".

DT is a strategy for companies to integrate digital and physical components to change business models and establish new directions in their industry [48]. DT typically refers to the process of creating new value and building appropriate business models by using digital technology to dismantle and reorganize existing value chains [49]. Moreover, companies can promote their economic interests while also creating social value [6,7]. So, can not DT of enterprises enhance the authenticity of CSR activities? This study focuses on this question.

At the core of the FIR is the DT in all areas of individuals and companies, especially from a corporate perspective, which means innovation in corporate operations through digitalization [50]. In 2004, Professor Erik Stolterman of Sweden first referred to "DT" as "a phenomenon in which human life improves in a better way by utilizing IT technology". At the firm level, many businesses apply digital technology to improve business models.

DT is important for companies through the connection of things to things, real-time accumulation and analysis of information, product serviceization, and service produc-

tion [51]. In particular, this DT is critical for the "flexibility" it provides. In terms of business, DT is not just about achieving business performance through the application of digital technology but rather about creating new added value, new business models, and changes in the enterprise [52].

In January 2016, the WEF (World Economic Forum) published a white paper titled "Digital Enterprise" in collaboration with Accenture, a consulting firm, under the theme "DT of Industries". This paper states that more fundamental changes are required for analog companies to change into digital companies. Four key factors were identified that included exploring new business models, reexamining underlying digital operational models, strengthening digital capabilities using talent and skills, and expanding new digital traction metrics (Table 1).

Table 1. Four key factors and detailed description of each factor by WEF.

	Core Requirements	Specifications of Each Core Requirement
1	Digital business models	Identify, develop and launch new, digital business models Set up a successful corporate venturing business
2	Digital operating models	Re-examine every aspect of operations Understand and leverage data
3	Digital talent and skills	Consider increasing your investments in security Build a high-quotient digital workforce
4	Digital traction metrics	Establish the right digital traction metrics Convince your investors about your digital transformation journey

Source: WEF (2017) "World Economic Forum White Paper (2016)".

According to Orbik and Zozulakova [18], CSR and DT are important factors in upgrading global competitiveness in the modern society. DT reduces the impact on the envi-ronment and expands talent diversity, enabling companies to comply with their social responsibilities [53]. Furthermore, higher digital maturity, better governance structure, and more comprehensive ethics regulations reflect the response to social responsibilities re-quired by the enterprise [54].

Among the major fields of the FIR, mobile and online payment, sharing economy, ar-tificial intelligence, electric vehicles, autonomous vehicles, robots, and IoT are related to DT. Although these fields exhibit different characteristics, they have common characteristics in terms of changing existing business models and strengthening competitiveness. Therefore, governments and companies need to identify DT policy trends, industry trends, business models, and strategies of major companies and industries. They should also seek ways to strengthen national and corporate competitiveness and new ways to cooperate each other with DT. Of course, if these changes are combined with Sustainable Development Goals (SDGs), which seek joint social and human prosperity beyond companies' economic value, they will have more positive effects.

3. Research Methodology

3.1. Attributes and Authenticity of CSR

Alhouti, Johnson, and Holloway [36] stated that consumers develop measures for attributes of perceived CSR and that CF, CI, and CSR compensation affect their CA. Furthermore, according to L'Etang [30], the persistence of CSR serves as a basis for determining whether an enterprise is conducting valuable CSR activities. The sustainability of CSR activities can have a positive impact on variables such as authenticity as well as overall evaluation. If this is incorporated into the CSR strategy, "the degree of continuous CSR activity of the company" can also be evaluated [26]. According to Ku and Shim [55], who verified the relationship between persistence and authenticity of CSR activities found that subjects also appreciate their authenticity if the persistence of CSR activities is high. A study by Park and Hwang [46] showed that CSR activities are perceived as authentic if they are consistently and continuously performed. Choi, Hwang, and An [56] found that consumers' perceptions of the four attributes of CSR: persistence, fit, impact, and differentiation, directly affect CA. A study by Kim and Lee [1] found that CF has a positive effect

on both CA and brand attitude. Holbrook [42] found that greater CI results in a greater likelihood of interpreting CA as altruistically-motivated. Furthermore, research by An, Wang, and Jeon [57] showed that the evaluation of CA is positive if an entity performs CSR activities on a scale that can contribute to solving social problems of high social interest. Hence, we propose the following hypotheses.

Hypothesis 1 (H1). *CSR attributes will have a positive effect on the authenticity of CSR (or CSR authenticity).*

Hypothesis 1-1 (H1-1). *The sustainability of CSR initiatives will have a positive effect on the authenticity of CSR.*

Hypothesis 1-2 (H1-2). *The fit of CSR initiatives will have a positive effect on the authenticity of CSR.*

Hypothesis 1-3 (H1-3). *The impact of CSR initiatives will have a positive effect on the authenticity of CSR.*

3.2. Mediating Effect of Digital Transformation

Today's relationship between business (or *economic value*) and moral (or *social value*) takes on CSR principles-based corporate activity forms, and the Internet and mobile devices have become efficient CSR communication and upgrading tools for enterprise organizations in the digital age. For example, DT has already greatly contributed to reducing pollutant emissions and increasing environmental protection, allowing people to solve existing problems in a more environmentally friendly way [18,58]. In addition, there seems to be little disagreement that digital transformation such as big data, the IoT, artificial intelligence, AR/VR, and robots will profoundly impact the labor sector. Summing up, CSR and DT are two of the most important factors of global competitiveness in the modern world [18].

Recently, global companies have strengthened their CSR activities by establishing an emergency management system to cope with the COVID-19 pandemic and actively participating in national emergency relief. In addition, governments are accelerating their push to reorganize the GVC and DT across all sectors to respond to the post-COVID era. Companies such as Sony (Japan), Seimens (Germany), Bing Group & Vietel (Vietnam), and Strata (the United Arab Emirates) used their production facilities to produce Covid-19 quarantine products or provide quarantine services. In addition, businesses are further strengthening their market dominance of online platforms using DT, as people who want to be safe from the Covid-19 outbreak are reluctant to make face-to-face contact. These new digital technologies are likely to structurally change consumer behavior and recognition [59]. Further, DT alleviates the information asymmetry between companies and stakeholders (including consumers) by broadening information channels, thus strengthening the authenticity of CSR activities.

DT has already significantly contributed to the reduction of pollutant emissions and increased environmental protection [18]. There are several cases of pursuing environmental sustainability through DT. Tesco is leveraging AI analytics to measure the environmental impact of sales activities and achieve carbon reduction targets [60]. The U.S. construction industry is reducing construction waste, which accounts for 25 to 40 percent of solid waste, by using drones [61]. In the agricultural sector, 'robotization of herbicide work' has reduced farmhouse herbicide usage by 20 times compared to conventional methods [62].

Using digital technology to reduce the environmental impacts and the diversity of talent leads to improved financial performance. This is because reducing carbon emissions or resource consumption can result in cost savings. For example, Maersk, a global carrier, has reduced fuel costs by 13% over the past two years by optimizing speed and routes through data analysis of sensors installed on ships [63].

Consequently, DT can also play an intermediary role in strengthening the authenticity of CSR, given the number of successful cases in which the purpose of CSR and its

core competency (or competitiveness) can be achieved simultaneously through digital transformation. Hence, we propose the following hypotheses.

Hypothesis 2 (H2). *Digital transformation will have a positive mediating effect between the attributes of CSR and CSR authenticity.*

Hypothesis 2-1 (H2-1). *Digital transformation will have a positive mediating effect between CSR Sustainability and CSR authenticity.*

Hypothesis 2-2 (H2-2). *Digital transformation will have a positive mediating effect between CSR fit and CSR authenticity.*

Hypothesis 2-3 (H2-3). *Digital transformation will have a positive mediating effect between CSR impact and CSR authenticity.*

The research model of this study, which combines the above hypotheses, is shown in Figure 1.

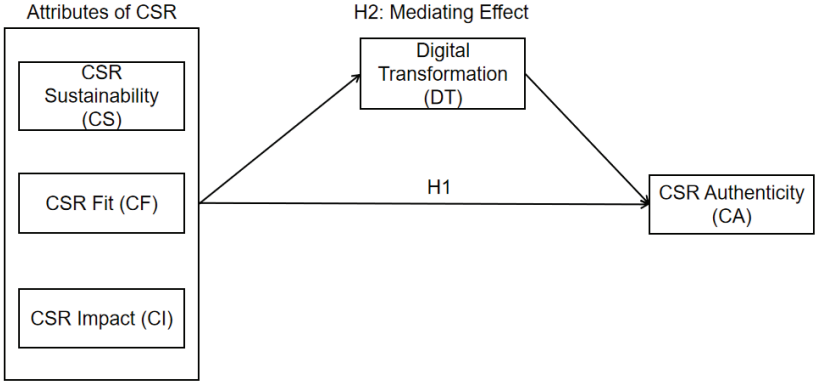

Figure 1. Conceptual model.

4. Empirical Analysis

In this study, data was collected through the use of questionnaires that used a five-point scale administered to general consumers who use electronic products in Korea and China. In the case of Korea, national leading electronics companies such as LG and Samsung were more specific target companies for CSR activities, while China were Xiaomi and Huawei. The survey period was from 20 January 2021, to 13 February 2021. In Korea, 200 questionnaires were collected mainly in Chungcheong Province, and 172 questionnaires were used in the final analysis, excluding 28 poor responses. In China, 200 questionnaires were collected mainly in Shandong and Hebei provinces, and 185 questionnaires were used for analysis, after excluding 15 inadequate responses. The sample characteristics of respondents are shown in Table 2.

4.1. Reliability and Validity Analysis

To assess the measurement qualities and discriminant validity of the model variables, a confirmatory factor analysis was conducted. The model includes items for CS, CF, CI, CA, and DT. The factor loadings of each item were higher than 0.5, demonstrating convergent validity (see Table 3).

Reliability analysis was performed for reliability testing of measurement items. Cronbach's α was used for internal consistency testing. Results found that the reliability of items is valid since all measures exceeded 0.6. Results are shown in Table 4.

Table 2. Characteristics of sample.

	Characteristics	No. (Korea)	% (Korea)	No. (China)	% (China)
Gender	Male	99	57.6	83	44.9
	Female	73	42.4	102	55.1
Age	10–19	10	5.8	5	2.7
	20–29	85	49.4	94	50.8
	30–39	36	20.9	50	27.0
	40–49	25	14.5	21	11.4
	≥50	16	9.3	15	8.1

Table 3. Variables and item description.

Variables	Items	Korean		China	
		Mean (SD)	Factor Loading	Mean (SD)	Factor Loading
CS	The company has been conducting CSR activities for a long time.	3.75 (0.576)	0.700	4.01 (0.600)	0.809
	The company continues to carry out CSR activities.		0.778		0.694
	The entity is consistently performing CSR activities.		0.795		0.724
	The company's CSR activities are systematic and are being carried out in accordance with the company's goals.		0.698		0.633
CF	The company's CSR activities are related to the characteristics of the company.	3.77 (0.610)	0.799	4.03 (0.556)	0.756
	The company's CSR activities are highly similar to the company's industry characteristics.		0.787		0.648
	The company's CSR activities are highly related to its corporate image.		0.758		0.705
	The company's CSR activities are highly related to its target customers.		0.712		/
CI	The company's CSR activities are on a scale sufficient to work.	3.76 (0.634)	0.658	3.99 (0.633)	/
	The company's CSR activities will help solve social problems in the long term.		0.771		/
	The company's CSR activities are making a meaningful contribution to solving social problems.		0.792		0.645
	The company's CSR activities help to recognize social problems.		0.777		0.778
	The company's CSR activities make me willing to participate.		0.609		0.644
CA	I feel the belief that this company is working for the public good.	3.59 (0.671)	0.598	4.02 (0.581)	0.683
	I think the company's CSR activities are heartfelt.		0.769		0.628
	This company has consideration for members of the society.		0.774		0.702
	I think this company's CSR activities are voluntary.		0.766		0.761
	The company's CSR activities are sincere.		0.845		0.749
DT	Companies can operate efficiently through digital transformation.	4.02 (0.629)	0.804	4.16 (0.521)	0.754
	Business turnaround time is reduced through digital transformation.		0.811		0.723
	Companies will reduce work costs through digital transformation.		0.748		0.521
	Companies are more productive through digital transformation.		0.816		0.716
	Business performance improves through digital transformation.		0.655		0.576

Table 4. Correlation and reliability analysis (Korea).

	CS	CF	CI	CA	DT	Cronbach's α
CS	1					0.706
CF	0.325 **	1				0.727
CI	0.412 **	0.354 **	1			0.676
CA	0.324 **	0.365 **	0.470 **	1		0.700
DT	0.422 **	0.274 **	0.425 **	0.355 **	1	0.706

Notes: N = 172; ** $p < 0.01$ (two-tailed test).

In China, reliability analysis was also performed for measurement items. For this analysis, it is assumed that there are no significant problems because values exceeded the 0.7 threshold (see Table 5).

Table 5. Correlation and reliability analysis (China).

	CS	CF	CI	CA	DT	Cronbach's α
CS	1					0.734
CF	0.388 **	1				0.743
CI	0.422 **	0.485 **	1			0.723
CA	0.387 **	0.304 **	0.404 **	1		0.760
DT	0.489 **	0.435 **	0.452 **	0.383 **	1	0.726

Notes: N = 185; ** $p < 0.01$ (two-tailed test).

4.2. Hypothesis Testing of Korean Samples

Looking at the regression results of the independent variables (attributes of CSR) and dependent variables (CA), two variables of CF (β = 0.204, t = 2.848) and CI (β = 0.352, t = 4.723) have statistically significant positive effects on CA. On the other hand, CS (β = 0.112, t = 1.523) was not significant. Therefore, hypotheses 2-2 and 2–3 are supported, while hypothesis 2-1 is rejected (see Table 6). However, the simple regression analysis of CS and CA showed to be significant (β = 0.325, t = 4.484). Therefore, it is difficult to judge whether there is a causal relationship between the two variables. In summary, the higher the fit of CSR activities and the impact of CSR activities, the greater the CA.

Table 6. Multiple regression analysis (Korea).

Dependent Var.	Independent Variables	R^2	Adjusted R^2	F	β (*t*-Value)
CA	CS	0.276	0.264	21.398	0.112(1.523)
	CF				0.204(2.848 **)
	CI				0.352(4.723 ***)

Notes: ** $p < 0.01$, *** $p < 0.001$.

As such, the preceding independent variables have a positive effect on consumer perception of authenticity for CSR activities. Therefore, if an entity engages in CSR activities, it needs to develop and implement marketing strategies that can have a great impact on long-term and appropriate levels of relevance and social issues.

Results for the mediating effects of digital transformations between independent and dependent variables are shown in Table 7. Variables of CS (β = 0.266, t = 3.429), CF (β = 0.276, t = 3.865), and CI (β = 0.19 and t = 2.579) simultaneously influenced the dependent and parameters (i.e., direct and indirect effects) in stage 3.

4.3. Hypothesis Testing of Chinese Samples

Looking at the regression results of the independent variables (or CSR attributes) and dependent variables (CA), two variables, CS (β = 0.245, t = 3.305) and CI (β = 0.26; t = 3.324), have statistically significant positive effects on CA. On the other hand, CF (β = 0.083 and t = 1.086) was not significant. Therefore, hypotheses 2-1 and 2-3 are supported, but hypothesis 2-2 is rejected (see Table 8). However, the simple regression analysis of CF and CA found CF to be significant (β = 0.304, t = 4.324). Therefore, it is difficult to determine that there is no complete causal relationship between the two variables.

Verification results for the mediating effects of digital transformations between independent and dependent variables are shown in Table 9. A partial mediating effect was found that affects all the dependent variables and parameters simultaneously, including CS (β = 0.254, t = 3.338), CF (β = 0.308, t = 4.112), and CI (β = 0.251, t = 3.411).

Table 7. Mediating the effect test of digital transformation (Korea).

	Stage of Mediating Test	β	t	p	R^2	Adjusted R^2	Result of Test
CS/DT/CA	Stage 1	0.422	6.064	0.000	0.178	0.173	Partial mediation
	Stage 2	0.324	4.461	0.000	0.105	0.100	
	Stage 3 (Ind_Var)	0.211	2.725	0.007	0.163	0.153	
	Stage 3 (Med_Var)	0.266	3.429	0.001			
CF/DT/CA	Stage 1	0.274	3.721	0.000	0.075	0.070	Partial mediation
	Stage 2	0.365	5.116	0.000	0.133	0.128	
	Stage 3 (Ind_Var)	0.29	4.057	0.000	0.204	0.194	
	Stage 3 (Med_Var)	0.276	3.865	0.000			
CI/DT/CA	Stage 1	0.425	6.121	0.000	0.181	0.176	Partial mediation
	Stage 2	0.47	6.95	0.000	0.221	0.217	
	Stage 3 (Ind_Var)	0.39	5.299	0.000	0.251	0.242	
	Stage 3 (Med_Var)	0.19	2.579	0.011			

Table 8. Multiple regression analysis (China).

Dependent Var.	Independent Variables	R^2	Adjusted R^2	F	β (t-Value)
CA	CS	0.225	0.212	17.531	0.245(3.305 ***)
	CF				0.083(1.086)
	CI				0.26(3.324 ***)

Notes: *** $p < 0.001$.

Table 9. Mediating effect test of digital transformation (China).

	Stage of Mediating Test	β	t	p	R^2	Adjusted R^2	Result of Test
CS/DT/CA	Stage 1	0.489	7.590	0.000	0.239	0.235	Partial mediation
	Stage 2	0.387	5.678	0.000	0.150	0.145	
	Stage 3 (Ind_Var)	0.263	3.454	0.001	0.199	0.190	
	Stage 3 (Med_Var)	0.254	3.338	0.001			
CF/DT/CA	Stage 1	0.435	6.539	0.000	0.189	0.185	Partial mediation
	Stage 2	0.304	4.324	0.000	0.093	0.088	
	Stage 3 (Ind_Var)	0.170	2.270	0.024	0.170	0.161	
	Stage 3 (Med_Var)	0.308	4.112	0.000			
CI/DT/CA	Stage 1	0.452	6.858	0.000	0.204	0.200	Partial mediation
	Stage 2	0.404	5.968	0.000	0.163	0.158	
	Stage 3 (Ind_Var)	0.290	3.933	0.000	0.213	0.205	
	Stage 3 (Med_Var)	0.251	3.411	0.001			

5. Discussion and Conclusions

Society-wide awareness of CSR activities has gone beyond passive donations or simple support, introducing a view of creating shared values (CSV) through social problem-solving [6,7]. Although CSR activities are increasing, consumers today want genuine CSR activities rather than campaigns aimed solely at short-term corporate profits [3,64,65].

This paper aims to enhance the understanding of the antecedent variables (CS, CF, CI) and their effects on CA. Furthermore, we consider the mediating effects of DT between attributes of CSR activities and CA. We conducted empirical analyses to verify our research model. With the onset of the FIR, most of the industries are actively developing and transforming, but the electronics industry, in particular, has been more affected than other industries. Moreover, we think CSR activities differ based on the industry. Therefore, we chose the electronics industry for our research. Meanwhile, Korea and China also have different social systems based on capitalism and socialism, which can affect CSR activities differently. Therefore, the Korean and Chinese electronic industries were selected for our CSR study. The summary and analysis of our results are as follows.

According to our Korean sample, CF and CI, which are attributes of CSR, had a positive effect on CA. On the other hand, CS did not show statistical significance when performing multiple regression analyses. However, it was statistically significant when simple regression was performed.

In analyzing multiple regression of the Korean sample, why was CS rejected? Usually, consumers not only have a positive attitude toward CSR activities but also appreciate the authenticity of CSR activities if CSR activities are judged to have been "continuously" executed [26]. Therefore, in the Korean sample, the rejection of CS in multiple regression should be more comprehensive and flexible, rather than interpreting that CS has no impact on the authenticity of CSR. In other words, although the impact of CS is smaller than the other two attributes (or CF, CI), it should be understood that CS also has a positive impact on CA since simple regression shows significant statistically. According to Kelly [28], consumers' contact with persistent or consistent stimuli causes "dispositional attribution (性向歸因)". In other words, in the case of the electronics industry in South Korea, it can be suggested that CSR activities should be continuously carried out regardless of the company's situation.

On the other hand, for the Chinese data, CS and CI, which are attributes of CSR activities, had a positive effect on CA. On the other hand, CF was not significant when performing multiple regression analyses. However, it was statistically significant when simple regression was performed.

According to the analysis results of the Chinese sample, CF did not significantly affect CA. Why did this result occur? In the case of Chinese consumers, there is an interest in whether companies perform social responsibility activities. However, interest in "CF" is relatively low as to whether an entity's social responsibility activities are appropriate for its image or characteristics.

In particular, this situation was more noticeable during the COVID-19 pandemic. For example, Wu Ling Automotive (五菱汽车) reduced its car production line and created a mask production line during the COVID-19 pandemic. Although producing mast by an automobile company is a far cry from the nature of the company, most Chinese consumers viewed the company's CA as being high.

Hypothesis 2 concerns the role of DT in the effect of CSR attributes on CA. More specifically, DT was found to provide mediating effects between CSR attributes (or CS, CF, and CI) and CA.

South Korea and China showed positive partial mediating effects between CSR attributes and CA. This means that consumers in both countries evaluate the authenticity of CSR based on whether the company's CSR activities are appropriate for the image of the company, whether the company's CSR activities are sustainable, and whether the company sufficiently addressed the social problems. In the meantime, based on empirical analyses (or mediating effects), it is suggested that the CSR attributes can affect CA more effectively through "DT".

6. Implications and Limitations

Overall, this study is meaningful in carrying out empirical analyses between CSR attributes and CA, and identifying the mediating effects of DT with Korean and Chinese samples. This research has the following detailed academic implications. First, this research is valuable in that it examines CSR attributes that include: (1) CF with the service or image provided, (2) CS, and (3) contribution to solving social problems (CI). Although there are some differences in factors depending on the systems and cultures in South Korea and China, the three basic attributes of CSR activities are important factors in customers' recognizing the authenticity of CSR.

Second, the role of "DT" in the era of the FIR is becoming increasingly important. However, there is little research on how DT plays a role in CSR activities and how DT is related to CSR. One example is how CA reflects the perceptions of stakeholders and customers. In fact, stakeholders and customers need to be made aware of CA. Digital en-

vironments can validate CA claims, which can alter purchase decisions. Furthermore, this study provides empirical evidence that DT must also be considered when undertaking CSR activities.

Third, we should recognize the "differences" and "commonalities" between Korea and China. In commonalities perspective, CSR attributes and DT must be important factors in Korea and China. On the other hand, when the attributes of CSR affect the authenticity of CSR, CS in Korea and CF in China have a relatively low influence. Future research will be needed on why this phenomenon occurred. For example, is it due to cultural differences? Or are the characteristics unique to the electronics industry combined with cultural characteristics that cause this? Future research on CSR and competitiveness could provide a more meaningful approach to corporate strategy and vision.

Meanwhile, this study provides several practical implications. First, the empirical results of this research show that not only the CF but also the CS and CI among CSR activities are important factors. Therefore, if a company engages in a variety of CSR activities, it will need to consider CF, CS, and CI together.

Second, a clear mid- to long-term strategy for "CSR" and "DT" is now needed. Traditionally, CSR activities were based on donations or environmental protection. However, CSR through DT using new technologies is a future trend. It is time for a mid- to long-term plan for these goals. These efforts will eventually increase the performance of the company and lead to greater corporate competitiveness.

Finally, the logic of this study is related to the ideology of CSV (creating shared value), which seek to strengthen CSR activities and company's competitiveness simultaneously and is a desirable direction for the future [6,7].

Successful examples of CSR activities mentioned in this study include TESCO's utilization of AI analysis technology, agriculture using robots and drones, the use of drones in construction waste, and Maersk optimizing speed and route efficiency through data analysis of sensors installed on ships [61–63]. CSR and DT are now essential factors of a company's successful operations.

This study began with the question, "Does DT strengthen CSR authenticity and corporate competitiveness?" If a company's competitiveness is strengthened by DT, CSR authenticity can be performed more easily, at a lower cost, and more efficiently.

Finally, the analysis of the differences between Korea and China suggests future strategic directions for CSR activities to relevant companies and multinationals operating in these countries.

This study presented many valuable implications. Nevertheless, and it features several limitations which may help future research. First, this study was conducted mainly on consumers in the electronics industry. Therefore, it may be difficult to generalize the findings to other industries, and further analysis needs to be conducted in other industries. Second, this study can also be seen as a transdisciplinary study [66]. In our survey, questionnaire items related to DT and attributes of CSR were somewhat insufficient. Therefore, the transdisciplinary integration between the two fields needs to be somewhat supplemented. Future research will also require consideration on how to integrate the two fields effectively.

In addition to the attributes of the three CSR activities covered in this study—CS, CF, and CI—future research can also consider additional attributes such as transparency and differentiation of CSR. Moreover, through continuous discussions on the criteria for judgment and evaluation by Korean and Chinese consumers and stakeholders on CSR activities, various issues should be addressed in future CSR-related research. Furthermore, while empirical research on the importance of DT is important, support such as case studies under the theme of strengthening competitiveness through CSR and DT can provide a better focus for future research.

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Abbreviations

FIR	The Fourth Industrial Revolution
CF	CSR Fit
CS	CSR Sustainability
CI	CSR Impact
CA	CSR Authenticity
DT	Digital Transformation

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The Construction Industry as the Subject of Implementing Corporate Social Responsibility (the Case of Poland)

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Abstract: Companies of the construction sector face a significant impact on the environment and people: consume massive amounts of natural resources, emit pollutants, and generate large amounts of waste, are a place of danger and accidents at work. It is well established that implementation of CSR principles can lead to several economic, social, and environmental benefits. This is shown by numerous studies carried out in various countries among companies from different sectors of the economy. The aim of the article is to identify the most determining activity motives, barriers, and effects of implementing CSR principles by enterprises of the Polish construction sector and to determine the differences in this aspect between large, medium, and small-size enterprises. A questionnaire survey covered 177 enterprises. Factor like size, a place of origin, type of capital (domestic, foreign), annual turnover and time in the market were also considered. The documents of enterprises, reports, statistical data, and internal regulations of companies were also examined. The research results show large variations in terms of motives, barriers and expected benefits out of the implementation of CSR principles in various types of construction enterprises. There are different ways of implementing CSR principles and incorporating this area into organizational structures of the companies. A special role is assigned to large enterprises that show the greatest commitment in this scope. They become sources of good practices for other types of enterprises.

Keywords: corporate social responsibility; construction sector; strategy; motives; barriers; effects

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1. Introduction

The construction sector is characterised by a number of features that distinguish it from other sectors of the economy. Many studies show that, together with related sectors, it is a key contributor to job creation and GDP [1–5]. At the same time, it is very vulnerable to changes in the economic situation and changes in the labour market. It is even pointed out that the construction sector is characterised by a duality—on one hand, it is parametrised by market indicators of the end product, i.e., to a large extent the real estate market, while on the other hand, it is determined in parallel by the market for prices of construction products and services, the labour market, including lower-skilled workers, and the capacity and competitiveness of construction enterprises themselves.

The specificity of the construction sector is mainly determined by the high dynamics of changes in the construction process (large number and variety of actors involved and multiple processes), fierce price competition and capital intensity, contractor expertise, high labour intensity, exceptional importance of the public sector and long life of the final product [6]. These elements influence its volatility, its level of risk and its diversification. Faced with such characteristics, the functioning of the construction sector in the context of its relationship with the environment becomes a major challenge. Many researchers argue that it is an activity with high environmental pressure, wastefulness, limited environmental and social efficiency, characterized by reactivity [7].

In the case of the construction sector, the topic of corporate social responsibility (CSR) is therefore of particular relevance, as it is more often exposed than other sections of the economy to violations of environmental or health and safety requirements, and communities, employees and socially conscious clients expect firms to demonstrate they are good corporate citizens [1,8,9]. Construction contributes to a heavy burden on the environment, as it causes significant consumption of natural resources and is a source of numerous pollutants and waste [10]. The construction sector is also burdened with numerous health risks for workers [11,12]. According to statistics from many countries, construction has the highest number of fatal and serious accidents.

The justification for undertaking CSR activities in the construction sector may be the legitimacy theory, which "is a mechanism supporting organizations in implementing and developing voluntary social and environmental disclosures in order to fulfil their social contracts that enables the recognition of their objectives and the survival in a jumpy and turbulent environment" [13]. In effect social perception of the organization's activities is reported in line with the expectations of the society. At the same time, there is a lot of evidence that compliance with CSR and other corporate governance principles, as well as their reporting to the public, is reflected in the perception of the organization and improvement of its image [14,15].

The literature studies indicate that, so far, no research has been conducted on the motives of Polish construction sector companies in implementing the CSR concept. Although the results of a number of studies aimed at determining the level of implementation of the social responsibility concept in Polish enterprises are present in the literature [16–21], they do not apply to the construction industry. The barriers that hinder construction enterprises from being active in CSR have not been identified. There is also a lack of studies that would indicate the effects that construction enterprises expect from the implementation of socially responsible activities undertaken. There is an increasing number of social responsibility reports presented by various industries, as well as a growing number of literature items describing ways of implementing the CSR concept, presented as business models. Although these models present the level of implementation of social responsibility, they do not show the determinants of CSR implementation in construction enterprises. This is a significant research gap, which inspired the subject of this article. Due to the fact that no research was carried out in Polish construction industry companies regarding their relations with CSR before, this study is unique. The presented results and conclusions may be an interesting comparative material for other economies of Central and Eastern Europe, as well as other industries in these countries. The study is part of a broader and constantly developing stream of research on CSR in the construction sector, concerning other countries, with particular consideration of the scale of the conducted activity and its connections with the tendency to implement CSR.

The article tends to identify the role that CSR principles play in the activities of Polish construction sector enterprises. The main aims of the article are to determine the degree of implementation of CSR postulates, to identify the motives that construction enterprises follow when deciding to implement CSR principles, to identify barriers and to determine the effects of implementation of CSR principles by construction companies. The differences between large, medium, and small-size enterprises in that scope, are determine.

2. Literature Review

An important area of CSR activities of construction enterprises are activities for the local community and the immediate environment. Construction investments often interfere in the daily lives of the inhabitants. Dialogue with social groups exposed to inconvenience is therefore necessary [11].

It is pointed out that when more and more companies publish information about their CSR activities, at the same time any negative aspects of their activities are concealed [22]. The reason for this attitude is the desire to maintain a positive image and desired reputation. Within a single company, one can encounter examples of both social responsibility and

business irresponsibility. And construction is one of the sectors that are particularly important from the point of view of their impact on the natural environment and society, moreover, playing an important role in the contemporary economy, contributing to its development and stabilisation. Moreover, the construction industry is one of the largest consumers of intermediate products (raw materials, chemicals, electrical and electronic equipment, etc.) and related services [23]. The construction industry faces numerous challenges in terms of inter alia, resource efficiency, reducing the negative impact of buildings on the environment and human health, and reducing waste and pollution.

However, while CSR research in construction has accelerated in recent years, it remains fragmented and unconceptualised, as being confrontational [24]. Indicating the way of implementing CSR goals in building the strategy of enterprises in the construction industry as well as defining the scope, motives, barriers, and effects of implementing CSR principles by enterprises are the main objectives of the considerations undertaken.

Consideration of the issue of motivation of organisations to engage in CSR has been performed for a long time. They largely focus on answering the question: do companies use this tool as a result of their beliefs and values, or are they motivated by purely utilitarian reasons? Liston-Heyes and Certon [25] argue that few companies engage in CSR activities driven by altruistic motivations [26]. In fact, companies aim to achieve both their own benefits, as well as positively influence the company's environment [27–29].

Currently, the most common division is into two groups of determinants affecting the use of CSR by enterprises—internal (they are shaped by the internal environment of the organisation) and external (institutional, created by the environment in which a given company operates). Both groups of factors can simultaneously stimulate and block entrepreneurial activity [30], and consequently determine the involvement of enterprises in CSR activities. The group of internal factors includes the size of the entity, capital resources, human resources, origin of capital and time on the market and attitudes of managers [30–36].

External factors, defined by Kudlak [37] (p. 18) as 'a set of formal and informal factors that influence the level, scope, and form of enterprises' engagement in CSR', include: existing legal regulations, institutional effectiveness, social pressures and expectations, the behaviour of other enterprises and organisations (including competitors, suppliers, contractors, investors contractors), informal social norms (reciprocity principle, customs, cognitive-cultural patterns) [37–41].

In terms of validating enterprises' motivations to implement CSR, depending on the industry and the region, different factors play a dominant role [40–47]. An interesting analytical perspective is also to inscribe intrinsic motivations in the mechanism of moral attitudes, which holds that CSR is a moral duty of companies towards society, and extrinsic in strategic motives, which holds that CSR contributes to the financial success of the company in the long run [48]. In a review study adopting this perspective Grimstad, Glavee-Geo and Fjørtoft [49], addressed the situation of small and medium-sized enterprises (SMEs) by asking: do SMEs' intrinsic motivation drive CSR activities more than extrinsic motivation? And their findings suggest that SMEs' intrinsic motivation drives CSR more than extrinsic motivation. Similar results were also obtained by Graafland and van de Ven [48] or Graafland, Kaptein and Mazereeuw [50].

However, the specificity of the construction industry requires the issue of CSR implementation in its enterprises to be considered in a separate context. It results from the separateness of this sector described above, which on one hand can be analysed in relation to enterprises and commercial undertakings, and on the other in relation to the activity of public authorities that award contracts for construction projects. As a result, there is a specific mix of internal and external factors, reflected in the strategies, management styles and objectives of the companies in the sector, as well as in the legal regulations that determine them, the nature of the markets or the requirements of the main users of the services. As Losemore and Lim [24] argue 'construction industry companies need to practically adjust and adapt their CSR strategies to fit with the constantly changing political, social, cultural,

environmental, and economic profiles of local communities and the requirements of clients and local governments'. These requirements can fit into the trend of socially responsible procurement (SRP), which utilises government expenditure on construction procurement as a means of generating social value from construction activities [51,52].

Authors of a broad review of research findings, relating to drivers, motivations, and barriers for CSR implementation by construction enterprises, Zhang, Oo, & Lim [53] point to a number of categories (sub-themes) that can be analysed for each of these areas (Table 1). These refer to both factors external and internal to the enterprise.

Table 1. The conceptualization of drivers, motivations and barriers of implementing CSR in the construction sector in developing and developed countries.

Category	Sub-Themes	Most Frequent Attributes
Drivers	policy pressure, market pressure, innovation and technology development	Critical stakeholders' (e.g., clients, investor, shareholders customers, end-users, joint venture) demand or pressure, market shift; Competitor pressure (e.g., competitors' CSR strategies)
Motivations	financial benefits, branding, reputation and image, relationship building, organizational culture, strategic business direction	Branding, image management, public reputation; Public expectation/pressure, media pressure; Organizational culture and awareness: core business value, personal values of the founder or entrepreneur, ethical beliefs and consideration, doing the right thing, business imperatives
Barriers	government policy, construction enterprise (business organization), the attributes of CSR, the stakeholder perspective, the construction industry	Lack of awareness, knowledge, and information within the organization; Lack of capacity and expertise; Lack of internal resources; Lack of strategic guidance and support from senior leaders or managers within the organization; The negative attitude within the organization

Source: own elaboration according to [53,54].

As a result, they point to the key issues, most frequently raised in the literature, which are part of the groups of drivers, motivations and barriers (referred to as sub-themes or perspectives) and also present their attributes in the form of specific conditions in a given group. The review shows that companies are far more likely to point to factors that are barriers on the side of the business organisation than to drivers and motivations. The key barriers identified are shortcomings that lie directly with the business such as lack of awareness, knowledge, and information within the organization, lack of capacity and expertise, lack of internal resources or lack of strategic guidance and support from senior leaders or managers within the organization, all contribute to the overall barrier that is the negative attitude within the organization [55–58].

3. Materials and Methods

The research assumption adopted is that the variables differentiating the behaviour of Polish construction sector enterprises towards CSR requirements are: the size of employment, annual turnover, capital ownership and time of market presence. In the study, the size of enterprises was adopted as a differentiating factor of their behaviour. Other variables were used only in the analysis of the scale of implementation of CSR principles.

The following research hypotheses are posed:

1. Enterprise size, turnover, time on the market and origin of capital are factors that differentiate the degree of implementation of principles in individual CSR areas [7,42,47,53,54].

2. Large enterprises in the field in question influence the organizational structure of the entity [43–45,58].
3. Small and medium enterprises implement postulates and principles of Corporate Social Responsibility, to a large extent, in a non-formalized manner. Such activities are not part of the company's strategy [30,41,42,47,59].
4. For large companies implementing CSR postulates, image benefits are very important, and financial benefits may be distant in time [20,46].
5. The main barriers related to the implementation of CSR in small and medium enterprises relate to restrictions in the field of knowledge in this scope [35,60].
6. Owners and managers of small construction enterprises perceive CSR activities only as a cost that will not bring any additional benefits.

The study was carried out by means of a diagnostic survey. The techniques applied were face-to-face questionnaire and online survey (CASI—computer assisted self-interviewing—technique). An original survey form was used. The form consisted of closed and semi-open questions, arranged in thematic blocks concerning motivating factors, barriers, benefits and disadvantages of implementing CSR principles. The questions used a nominal scale (two-level), a five-point semantic scale and an ordinal measurement scale (five-point Likert scale). Additionally, open-ended questions were included in part of the questionnaire to elaborate on the respondents' answers.

The subjects of the analysis were small construction companies (with 10–49 employees), medium-sized companies (with 50–249 employees) and large companies (with 250 or more employees). Micro companies were excluded from the survey. Organisational units were considered:

- conducting a registered business activity,
- whose activities, in accordance with the Polish Classification of Activities, are carried out under section F, division 41: works related to the erection of buildings,
- not in bankruptcy or liquidation,
- operating in Poland.

The sample for the study was selected using the purposeful method. A random selection was affected by the unavailability of a sampling frame and the prohibitively high financial costs of conducting the survey. The sample size was determined based on two key considerations. Firstly, we took into account the specificity of the analysed companies and difficulty in obtaining relevant data—difficulty in convincing representatives of companies from the section to take part in the research. Secondly, statistical requirements regarding the minimum sample size were taken into account. It was assumed that the minimum sample size should be 100–200. This type of sample size is usually required when many statistical tests are applied and is appropriate when we do not have to deal with too detailed presentation of results (high level of spatial aggregation or less precisely defined domain-cross-sections) [61] (p. 16). Finally, in the survey conducted, the sample size was 177, of which 106 were small companies, 49 were medium-sized companies and 22 were large companies.

In connection with the adopted selection of the research sample, it should be borne in mind that the obtained results may be burdened with an error, the size of which cannot be determined as precisely as in the case of random samples. The obtained results should therefore be interpreted with particular care.

On the basis of the data obtained from the EMIS, Amadeus and ALEO databases, an own list of enterprises (database) was drawn up, to which invitations to participate in the study were sent out with a questionnaire form via e-mail and traditional mail (The databases mentioned are: EMIS (Emerging Markets Information Service)—a web service containing information on more than 80 emerging markets worldwide, whose provider is Euromoney Polska S.A., Amadeus—an international database containing information on more than 20 million companies from 43 European countries, leading providers: Info-Credit and Bureau van Dijk Electronic Publishing, ALEO—a Polish database containing data on all companies registered in the KRS [*National Court Register*] and CEIDG [*Central*

Registration and Information on Business], provided by ING Usługi dla Biznesu S.A.—part of the ING Group. It should be emphasised, however, that these databases do not contain all companies from the PKD [*Polish Classification of Activity*] section analysed in the study, therefore the obtained list could not be treated as a sampling frame. This justified the purposeful sample selection used in the study). In some cases, especially large companies, a telephone contact was made. Invitations to the survey were addressed to persons directly responsible in a given organisational unit for Corporate Social Responsibility issues, the owner of the company, or a relevant (in terms of form and subject matter) person at the top management level. In case of lack of response from the companies, messages reminding about the previous request were sent at least twice.

2047 invitations were sent out. As a result of own research, empirical material was obtained from a total of 177 construction companies. The return rate of the questionnaires was 8.65%.

The time scope of the study covered the period from February to November 2019. The surveyed sample was dominated by small-sized enterprises with between 10 and 49 employees and they accounted for 59.89%. The share of medium-sized enterprises was represented by 27.68% of entities. The remaining group accounting for 12.43% of the research sample belonged to the category of large enterprises.

Comparing the structure of the general population with the surveyed sample of enterprises, one finds structural differences between particular size categories of enterprises. The share of small companies in the general population is higher by 28.66 percentage points than the share of entities of this size in the research sample. In case of medium-sized and large enterprises, their share in the survey was more numerous than the information on the general population indicated (Table 2). Finally, the selection of the sample was disproportionate and resulted from the adopted purposeful selection of entities.

Table 2. Comparison of the structure of the general population and the research sample.

Employment Volume	Size of the General Population	Share of Enterprises in the General Population (%)	Number of Enterprises Surveyed	Share of Enterprises in the Test Sample (%)
from 10 to 49	6543	88.55	106	59.89
from 50 to 249	794	10.75	49	27.68
250 and above	52	0.70	22	12.43
Σ	7389	100	177	100

Source: Own study.

Differentiation of the sample in terms of the basic characteristics of enterprises allows for taking into account a number of variables in the analyses (Table 3).

Among the enterprises that took part in the survey, most of the enterprises use exclusively domestic capital (87.57%). The remaining enterprises declared mixed ownership (9.04%), and the least capital belonging exclusively to foreign entities (3.39%). The survey was dominated by enterprises with an annual turnover of up to EUR 10 million (64.41%). The research sample also included entities whose annual turnover in the surveyed year is higher than EUR 10 million, but does not exceed EUR 50 million (24.29%). The least numerous group are enterprises whose annual turnover exceeds EUR 50 million (11.30%). Most of the entities participating in the study have been operating in the market for more than 20 years (47.46%), while the smallest group was represented by companies with seniority between 10 and 20 years (20.34%). The remaining companies were those with up to 10 years of presence on the market (32.20%).

Table 3. Characteristics of the research sample in various sections.

Surveyed Enterprises		**N = 177**	
Criterion		**Number of Observations**	**Percentage of Observation in the Research Sample (in%)**
Origin of capital (ownership form)	only domestic	155	87.57
	only foreign	6	3.39
	mixed with foreign capital participation	16	9.04
Annual turnover in the year under review in EUR million	up to EUR 10 million	114	64.41
	above EUR 10 million up to EUR 50 million	43	24.29
	over EUR 50 million	20	11.30
Market presence in years	up to 10 years	57	32.20
	over 10 years to 20 years	36	20.34
	over 20 years	84	47.46

Source: Own study.

Two statistical programs were used in the analysis process: R and SPSS. The following methods were applied: elements of descriptive statistics (statistical parameters in the form of mean, dominant), independence test χ^2, Varimax factor analysis and Bartlett's sphericity test. Appropriate visualisation and tabulation of the obtained results were performed. Due to the necessity to separate the compared groups, it was necessary to define the independent variables (so-called grouping variables) and the dependent variable, which during the research were compared in the groups (Table 4). This analysis was conducted for all companies together and for individual, distinguished categories.

Table 4. Variables adopted in the research process.

Dependent Variables	**Independent Variables**
enterprise size annual turnover time of presence on the market capital ownership	scope of CSR activities carried out by enterprises motives for implementing CSR concepts barriers to implementing CSR concepts benefits of implementing CSR concepts disadvantages of implementing CSR concepts

Source: Own study.

The application of the above research methods enabled the falsification of the research hypotheses.

4. Results

4.1. Scope of Implementation

In Poland, only 37% of enterprises from the construction sector declare that they implement the principles of CSR. Considering three variables: company size, origin of capital, annual turnover and seniority in the market, the CSR principles are implemented mainly by large companies with foreign or mixed capital, high turnover and long market presence [21,30,36]. The conducted research indicates that between individual groups of enterprises, distinguished according to the above criteria, there are significant differences in the implementation of CSR principles. This allows us to maintain the first of the hypotheses made—the size of the enterprise, turnover, time on the market and origin of capital are the factors differentiating the degree of implementation of principles in individual areas of CSR [7,42,47,53,54] (Table 5).

Table 5. Implementation of CSR principles by Polish construction sector enterprises (%).

Description	Total	Company Size			Origin of Capital		Annual Turnover (EUR Million)			Market Presence (Years)		
		Small	Medium	Large	Domestic	Foreign and Mixed [1]	≤10	>10 ≤50	>50	≤10	>10 ≤20	>20
Yes	63	25	43	77	33	68	22	53	85	30	36	42
No	37	75	57	23	67	32	78	47	15	70	64	58
N	177	106	49	22	155	22	114	43	20	57	36	84

Source: Own study. [1] For the purposes of the study, two categories of capital were adopted. Therefore, the category of enterprises with only foreign capital was combined with the category of entities in which own and foreign capital is involved. The reason for this was that there were few companies with foreign capital in the sample.

Large enterprises are characterised by a different specificity of operations in the context of the implementation of CSR principles than medium and small enterprises. The independence test χ^2 ($\alpha = 0.05$) showed that there is a statistical dependence between enterprise size and the manner of CSR activities implementation. In the majority of small (85%) and medium enterprises (71%) that implement the CSR principles, these activities are not inscribed in their operational strategy. The situation is different in large enterprises—55% of them declare that CSR activities are included in their development strategy. A vast majority of small (91%) and medium enterprises (94%) do not plan and control their CSR activities in the light of the assumed effects. Despite the majority of large companies declare that they do not conduct similar activities either, their percentage is much lower—59%. Small companies (94%) and medium-sized companies (82%) generally do not employ persons responsible for implementation of CSR principles. Similarly, small (97%) and medium-sized companies (80%), in general, do not have information on their websites about their involvement in the CSR process. In contrast, large companies, employing more than 250 persons, have in their structures a person responsible for the implementation of CSR (59%), as well as publish information on their involvement in CSR activities on their websites (73%).

In small companies, there are no persons (specialists) directly involved in the implementation of CSR principles. The owner (56%), or the management board (33%) are mainly responsible for socially responsible activities. In medium companies, the management board (45%) or the marketing department (43%) deal with CSR. It looks differently in large enterprises, where CSR specialists are appointed—27% of the surveyed entities in this category declared employing such a person. Moreover, similarly as in the case of medium enterprises, the management board (73%) and the marketing department (50%) are responsible for CSR activities. Other units indicated by the respondents, involved in the implementation of CSR principles were administration department, chief accountant, investment specialist, proxy, communication department, management of organisational units, all employees.

The above results allow us to support two further research hypotheses, that large enterprises undertake intentional, formalised activities, and their activity in this area may affect the organisational structure of the entity, and that small and medium enterprises implement postulates and principles of Corporate Social Responsibility to a large extent, in a non-formalised manner, and these activities are not an element of the company's strategy. The factors that allow to explain these differences are motivations, barriers and expected benefits related to the implementation of CSR.

4.2. Motivations

Representatives of Polish construction sector enterprises have various expectations as regards the effects of implementing CSR postulates. Most of them expect first of all an improvement in relations with society. Respondents assessed their motivations for implementing CSR principles on the basis of a Likert scale. They addressed each of the given barriers, assessing whether its importance is very high (value 5), high (4), medium (3), low (2), or very low (1). Respondents assigned an average value of 4.11 to this effect. In

second place the respondents put image benefits, while financial effects may be distant in time (Figure 1)

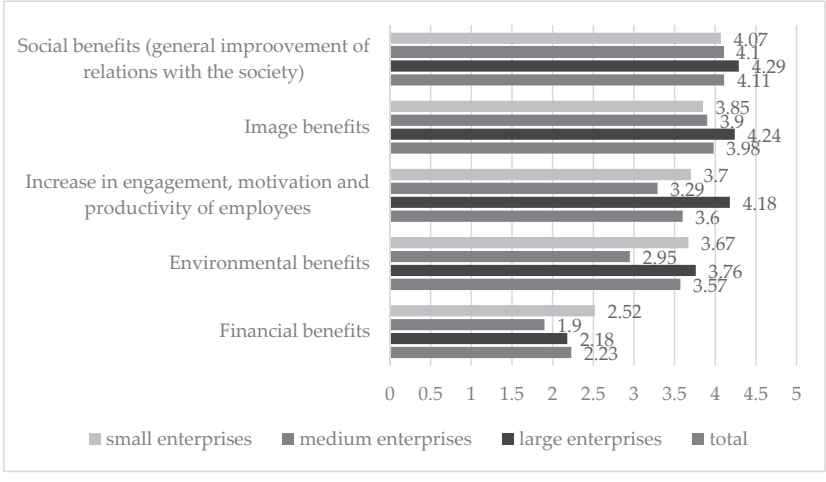

Figure 1. Expected benefits from implementation of CSR principles by Polish construction sector enterprises—importance assessment.

The indicated motivation may find their justification in the different perception of the construction sector. On the one hand, it is necessary for the success of investments and economic development, but on the other hand, it is not perceived as a safe and reliable employer [10–12]. No wonder then that managers strive to improve the image of the industry and first of all try to highlight social benefits, which also affect the immediate and further environment outside the enterprise. However, not all studies confirm such a marginal role of the financial factor, especially in smaller enterprises, it is of considerable importance, even if possible financial benefits are deferred in time [20,46].

The above results allow to maintain the hypothesis that for large enterprises that implement CSR postulates, image benefits are very important, while financial benefits may be distant in time. It should be added, however, that also other benefits (social, environmental, organisational) are more important than the financial benefits expected as remote in time. It is also worth pointing out that this regularity concerns not only large enterprises, but also medium and small ones.

4.3. Barriers

The respondents assessed the barriers to implementing CSR principles according to the same scale as in the case of motivation. The main obstacles to running socially responsible business Polish enterprises from the construction sector see in lack of time and knowledge on the benefits of CSR. Another significant barrier for the respondents is also the lack of supporting and advisory institutions (Figure 2).

A great differentiation can be observed in the perception of barriers to the implementation of CSR principles by small, medium and large enterprises. Smaller enterprises perceive more barriers, to which they ascribe high and very high importance, than other enterprises. They perceive as many as 9 barriers, while in case of medium enterprises those are 3, and in case of large enterprises—2 barriers (Table 6).

Small enterprises indicate the whole set related to the lack of awareness and knowledge in the scope of CSR, as well as the lack of resources (time, personnel) as barriers to the implementation of CSR principles. Lack of awareness, attributed first of all to the management staff, is also the basic barrier indicated by medium enterprises. The representatives of enterprises convince that they rather have adequate knowledge in the scope in question,

although they are not aware of the benefits that their companies can obtain thanks to the implementation of CSR. However, the main barrier is the lack of time to deal with issues that are not at the core of current activities.

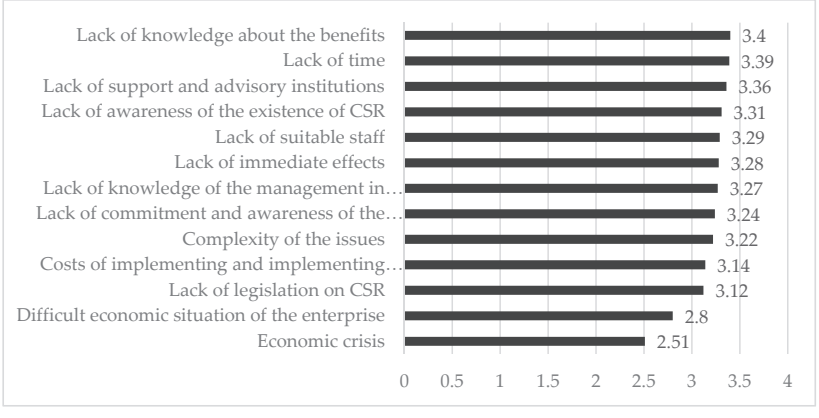

Figure 2. Barriers to implementation of CSR principles by Polish construction sector enterprises—importance assessment.

Table 6. Frequency of assessments of individual barriers to implementation of CSR principles.

No	Barriers	Dominant Companies		
		Small	Medium	Large
1	Lack of knowledge about the benefits	4	3	4
2	Lack of time	5	3	5
3	Lack of support and advisory institutions	4	3	2
4	Lack of awareness of the existence of CSR	5	5	3
5	Lack of suitable staff	4	3	3
6	Lack of immediate effects	4	3	3
7	Lack of knowledge of the management in this field	4	4	3
8	Lack of commitment and awareness of the management	4	4	3
9	Complexity of the issues	4	3	3
10	Costs of implementing and implementing CSR	3	3	3
11	Lack of legislation on CSR	3	3	3
12	Difficult economic situation of the enterprise	1	1	1
13	Economic crisis	1	2	1

Source: own study.

The reasons for this state of affairs are the limited resources, both financial and human resources, as well as the limited knowledge of people managing small companies. In the Polish reality, these are often people who simultaneously perform physical work, which they combine with company management, as a result they do not have enough time to perform additional tasks. Also, the perception of the benefits of implementing CSR seems quite distant to them, due to the number of current activities they are burdened with in their daily work.

Due to small differences between average values of variables, an in-depth analysis of factors describing barriers under consideration was performed. Its aim was to identify the most important and hidden factors that constitute barriers to the implementation of CSR principles. Large companies were excluded from the analysis due to their different specifics, and because of their small size in the conducted survey. For the purpose of the study, an exploratory factor analysis with Varimax rotation was used, which was preceded by

testing the validity of its use. Bartlett's sphericity test was applied to assess the significance of the correlation matrix and the Kaiser-Mayer-Olkin (KMO) coefficient was determined. The Bartlett's test statistic (U = 1126.72) was greater than the critical value, which for the assumed significance level and 78 degrees of freedom was 99.6. The null hypothesis that all correlation coefficients are equal to zero should therefore be rejected. The degree of adequacy as measured by the KMO coefficient was 0.88. This allowed the application of factor analysis. The principal component method with Varimax factor rotation was used to determine the factors. A determination of the number of factors was made using the Kaiser criterion. Factors with eigenvalues greater than 1 were left out. In the process of identifying factors that describe barriers to implementation of principles of Corporate Social Responsibility by small and medium construction enterprises in Poland, two eigenvalues were greater than 1, and allowed explaining about 61.7% of total variation. The factor corresponding to the first (largest) eigenvalue explains about 35% of total variance, while the second component explains about 27% of total variance. According to the Kaiser criterion, only 2 factors should be left, which explain 61.7% of the total variance. The validity of the choice was also confirmed by the Cattel's criterion of scree. In the further part of the study, using the principal components method with Varimax rotation, factor loadings were calculated. Only significant factor loadings were considered, after rounding not smaller as to absolute value than 0.8 (Table 7).

Table 7. Factor loadings obtained using the principal components method after Varimax rotation.

Variable	Component	
	1	**2**
Lack of knowledge of the management in this field	0.875	-
Lack of support and advisory institutions	0.873	-
Difficult economic situation of the enterprise	-	0.828
Economic crisis	-	0.824

Source: own study.

Finally, in order to give an interpretation of the common factors, the variables that are correlated with each factor were separated. The variables 'lack of management knowledge in the subject' and 'lack of supporting and advisory institutions' have high factor loadings (0.875 and 0.873 respectively) with the first factor. The variables 'difficult economic situation of the enterprise' and 'economic crisis' in turn have high factor loadings (0.828 and 0.824 respectively) with the second factor.

The first of these factors is therefore determined by two important elements: the lack of knowledge of the management in this area and the lack of supporting and advisory institutions. Due to the variables that describe it, it was defined as 'limitations related to obtaining/possessing knowledge necessary to implement CSR principles'. The share of this factor in the total variance of variables included in the study was 35%. The second factor, in turn, is described by two elements: the difficult economic situation of the enterprise and the economic crisis and was defined as 'constraints related to the economic situation inside and outside the enterprise'. The share of this factor in the total variance of variables included in the study exceeded 26%.

The above analysis allows us to sustain another hypothesis stating that the main barriers related to the implementation of CSR in small and medium enterprises refer to limitations in the area of knowledge in the subject matter.

This is also confirmed by the previously formulated conclusions resulting from the current limitations of the management staff and is partially reflected in the literature on the subject, including studies relating to other countries and sectors [16,36,42,47].

4.4. Benefits

Actual benefits obtained as a result of CSR implementation can be divided into two categories, taking into account their significance for the enterprise, expressed by the

assessed ones in the Lickert scale (1—very low significance, . . . , 5—very high significance). The first group consists of benefits, which are ascribed high or very high importance. In Table 8. these are the benefits presented in positions 1–9. The second group consists of benefits, which were ascribed low importance (items 10–13). Quite high consistency in this case between companies of different size categories is noticeable. The only exception is increased sales of services. Small companies see this as a very important benefit. Companies in the other two categories attribute little or very little importance to it. This is probably related to the fact that small enterprises, having implemented CSR principles, could become cooperators (subcontractors, partners in tenders) for medium and large enterprises implementing these principles.

Table 8. Frequency of assessments of individual benefits from implementation of CSR principles.

No	Benefits	Dominant Companies		
		Small	Medium	Large
1	Increase in sales of services	5	1	2
2	Enhancing the enterprise's good external image	4	4	4
3	Solving an urgent/important social problem	4	4	3
4	Increased trust on the part of local authorities	4	3	3
5	Increased motivation and identification of employees with the company	4	3	4
6	Contribution to the improvement of environmental protection	4	3	4
7	Increase in investors' interest	3	4	4
8	Increase in competitiveness	3	4	3
9	Improving relations with the local community	3	4	4
10	Increase in the enterprise's profitability	2	1	2
11	Better access to financial capital	1	1	2
12	Introduction/enhancement of environmental technologies	1	1	3
13	Application of CSR principles by suppliers and subcontractors	1	1	3

Source: own study.

On the other hand, the only disadvantage that the respondents ascribe significant importance to is the generation of high costs. It is particularly noticeable by entities from the group of small enterprises (Table 9).

In light of the above findings, the hypothesis that owners and managers of small construction enterprises perceive CSR activities only as a cost that will not result in any additional benefits should only be partially supported. It is true that CSR activities are perceived by small enterprises as capital intensive. However, these companies also perceive benefits from the implementation of CSR principles, attribute great importance to it and indicate increased sales of services as the most important one.

However, it is still a kind of financial motivator, though not a direct one, so with regard to small enterprises their economic condition is a determinant of choices. These are not companies that have the technical and organizational possibility to "devote" some resources or delegate them to other activities indirectly related to the company's operations. They are too small and too focused on their current activities. This is an important signal to those responsible for advice and lawmaking. Perhaps solutions supporting small enterprises in this area, or imposing specific legal requirements on them, may persuade their owners to broaden their activities in the area of CSR [16,19,36,47].

Table 9. Frequency of assessing particular disadvantages of implementing CSR principles.

No	Disadvantages	Dominant Companies		
		Small	Medium	Large
1	Generating high costs	4	3	3
2	Reduction of the enterprise's efficiency	2	1	1
3	Lack of public understanding and broader acceptance of such activities	1	1	2
4	Conflicts between different stakeholder groups about their own interests	1	1	2
5	Reduction of competitiveness on the market	1	1	1
6	Restriction of the enterprise's development	1	1	1
7	Departure from the profit maximisation principle	1	2	1

Source: own study.

5. Discussion

Our conclusions confirm some of the observations resulting from research appearing in publications on CSR in the construction industry in other countries [12,23,45,51,53]. Even publications containing research results of a causal nature or providing only an indicative, rather than a conclusive, trend of CSR in construction, contain similar insights [24]. Thus, it can be concluded that regardless of the place where the study was conducted (country, region) and the method adopted (full survey, random sample, purposive selection, pilot study), certain general regularities are consistently confirmed. The most important of these include:

- the existence of a large potential in the implementation of CSR in construction industry enterprises. Our study confirmed that less than 40% of enterprises in Poland consciously implement it, which also translates to the results of other researchers regarding other countries [62,63] and confirms that this is an industry where there is a great need for such activities [64];
- the significant dependence of potential and motivation in implementing CSR on company size, turnover, seniority, and origin of capital. The general regularity is that the larger the enterprise and the higher the share of foreign capital (presumably a higher level of internationalisation), the higher the propensity and effectiveness of implementing measures (Table 10);
- the perception of benefits from the implementation of CSR is related to the size of the enterprise, the only benefit that is 'strengthening the enterprise's image outside' was indicated as significant by enterprises from each of the size ranges, the others show greater differentiation. Similar conclusions were reached i.a. by Laudal [30], Santoso and Feliana [65] or Graafland [66].

It strongly confirms the often-raised fact that one of the key barriers to CSR implementation is insufficient knowledge of entrepreneurs [50,55]. It mainly concerns the benefits as well as the barriers of extending the responsibility of the business with a social component. Knowledge deficiencies are manifested, on the one hand, in the lack of information on the benefits that can be derived by implementing CSR in the enterprise, as well as in the lack of awareness of CSR in general (this is a particularly striking finding), as well as in the knowledge and competence deficiencies of top management and executives and rank-and-file employees. The scope also extends outside the enterprise. Some entities see the difficulty or even the impossibility of implementing CSR in the lack of supporting and advisory institutions. This is a problem that concerns small enterprises to the greatest extent. In the case of motivations to undertake activities in the area of social responsibility, motivations related to organizational culture and awareness are identified to a limited extent for these enterprises: core business value, personal values of the founder or entrepreneur, ethical beliefs and consideration, doing the right thing, business imperatives. It can be confirmed by the practices identified in small and medium-sized enterprises in other countries.

Table 10. The conceptualization of motivations and barriers of implementing CSR in the construction sector in developing and developed countries vs. its operationalization in Poland.

Category	Most Frequent Attributes	Most Frequent Attributes in Poland
Motivations	Branding, image management, public reputation; Public expectation/pressure, media pressure; Organizational culture and awareness: core business value, personal values of the founder or entrepreneur, ethical beliefs and consideration, doing the right thing, business imperatives	Social benefits, image benefits, increase in engagement, motivation and productivity of employees, environmental benefits, financial benefits
Barriers	Lack of awareness, knowledge, and information within the organization; Lack of capacity and expertise; Lack of internal resources; Lack of strategic guidance and support from senior leaders or managers within the organization; The negative attitude within the organization	Lack of knowledge, time, support and advisory institutions; Lack of awareness of the existence of CSR; Lack of suitable staff; Lack of immediate effects; Complexity of the issues; Costs; Lack of legislations

Source: own work and own elaboration according to [53,54].

The positively verified and confirmed hypothesis, stating that small and medium-sized enterprises implement the postulates and principles of corporate social responsibility largely in an informal way, is reflected, i.a. in the research of Bevan and Yung [59]. They demonstrate that a number of companies of this size incorporate some aspects of CSR into their business activities even though they do not refer to the practices as CSR, as none of them have a formal CSR policy in place. At the same time, quite strong motivations, and significant benefit potential cause enterprises to nevertheless decide, to varying degrees, to implement CSR elements in their day-to-day operations. However, they do not perceive as dominating the benefit that would eliminate the basic obstacles, i.e., raising awareness of the management and employees, expanding knowledge or acquiring new competences. Thus, no links are observed between benefits and opportunities to eliminate barriers—they occur in completely different areas. Most of the motivations are of an external nature, they are not focused on the internal situation of the enterprise and the condition of its staff. Companies rather pay attention to image benefits, financial benefits (although they allow for their distance in time), as well as social or environmental benefits. An indirect relation can only be observed between internal benefits (increased involvement, motivation, and productivity of employees) and the potential for raising employee awareness as a tool for eliminating barriers related to the lack of knowledge and competence. It can also be assumed that entrepreneurs perceive the area of raising competences as a necessary condition for the implementation of CSR, thus they do not assess it as a benefit of the whole process.

As a result of the conducted research, the hypotheses posed at the outset were positively verified and referred to: (1) key parameters differentiating the degree of CSR implementation in enterprises in the construction sector in Poland, which include—enterprise size, turnover, time of market presence and origin of capital, (2) purposefulness and degree of formalisation of activities in the scope of CSR implementation—in large enterprises these attributes are characteristic, while small and medium enterprises implement postulates and principles of Corporate Social Responsibility to a large extent in an informal manner, (3) scope of key benefits that enterprises indicate in connection with the implementation of CSR—for large enterprises, image benefits are very important, while financial benefits may be delayed in time, postponement of possible financial benefits is also admitted by small and medium enterprises, (4) barriers and difficulties in implementing CSR—which in small and medium enterprises refer to limitations in the area of knowledge in the subject matter, as often owners and managers of small construction enterprises perceive CSR activities exclusively as costs that will not bring any additional benefits. These are indications that show a high degree of convergence with the results of other studies conducted worldwide in relation to construction enterprises. The problems and barriers to implementing CSR are universal and depend more on the scale and level of internationalisation (in our study determined by the source of capital) than on the place of conducting business.

6. Conclusions

The conducted research aimed to identify the role that CSR principles play in the activities of Polish enterprises in the construction sector. An attempt was made to determine the degree of implementation of CSR postulates, identify the motives that construction enterprises follow when deciding to implement CSR principles, identify barriers and determine the effects of implementation of CSR principles by construction enterprises. At the beginning of the research, it was assumed that the variables differentiating the behaviour of Polish construction sector enterprises towards CSR requirements are: the size of employment, annual turnover, capital ownership and time of market presence.

The results obtained may constitute an important premise for decision-makers at the management level and for legislation, allowing to create better conditions for the development of CSR in the construction industry. However, further research should be of a slightly more qualitative nature and, as a result of in-depth analyzes (in the form of in-depth interviews combined with the Delphi method), to clearly identify the causes of differences and motivations.

The general conclusion that emerges as a result of the conducted research is the need for systemic support of the process of popularisation and implementation of CSR in enterprises of the construction industry. The specificity of the industry indicated in the introduction, often emphasised by many authors concerned with this issue, manifesting itself i.a. in the high level of risk, the importance of safety procedures, the large number of business partners and the significance of the sector in the overall economy, requires special attention to be paid to this issue. Moreover, both in Poland and in a number of other countries, the sector is dominated by small and medium enterprises, which are at a disadvantage when it comes to the advancement of CSR processes in day-to-day operations. Systemic, legislative and, above all, popularisation support could contribute to a systematic change of this state of affairs. As raised by Xia et al. [58] (p. 350) it is necessary to 'Create the avenue to build on the existing knowledge of CSR in the construction industry.' Otherwise, further research on the issue will be continually burdened by deficits in competence and knowledge, and the effectiveness and benefits of implementation will, especially for small and medium-sized enterprises, be judged on the basis of actions taken in a disorganised, haphazard or occasional manner.

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The Influence of Hotel Employees' Perception of CSR on Organizational Commitment: The Moderating Role of Job Level

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Abstract: This study attempts to investigate the relationships among Korean hotel employees' perception of Corporate Social Responsibility (CSR), their intrinsic motivations, and their organizational commitment (OC). The mediating effect of intrinsic motivation on the relationship between employees' perception of customer- and employee-related CSR and OC is explored, and the moderating role of job level on the relationship between CSR perceptions and intrinsic motivation is tested. The data were collected via online survey, and the Hayes' Process macro was used as an analysis tool. We found that (1) both types of CSR perceptions are important in creating intrinsic motivation and OC, (2) intrinsic motivation enhances OC, and (3) job level moderates the link between employee CSR perceptions and intrinsic motivation positively. Interestingly, we found that when customer-related CSR or employee-related CSR is high, the level of intrinsic motivation will significantly differ between managerial and non-managerial employees. This study's results will contribute to the current literature on CSR, and will aid human resources departments that are considering CSR practices as a means to enhancing employee intrinsic motivation and OC.

Keywords: CSR perception; organizational commitment; intrinsic motivation; moderating effect

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1. Introduction

The issue of Corporate Social Responsibility (CSR) has been receiving a great deal of attention in many academic areas and from the business media during the last two decades [1–3]. The reason for this is that CSR is regarded as a method of building an organizational reputation and enhancing the corporate image as well as providing advantages to both companies and their stakeholders [4]. Companies have gradually recognized the significance of CSR, and are attempting to maintain a balance among social, environmental, and economic activities in their businesses [5]. CSR tends to be considered along with responsible management to ensure sustainable growth [6]. Moreover, organizations involved in CSR activities are building positive corporate reputations, enhancing values and profitability, managing risks and costs, and promoting customer loyalty [7–10]. CSR activities are also implemented when faced with severe competition from new entrants to the market in service industries such as hotels [11]. Such activities provide various benefits to hotels, such as customer loyalty and a positive brand image, resulting in revisits and recommendations [12]. Thus, CSR activities are important to the stakeholders as well as the organizations [13,14].

Due to the competitiveness of the hotel industry, customer loyalty is critical [15]. Employees interact directly with customers, and those interactions influence customer loyalty [16], so attracting and maintaining quality employees is critical for competitiveness within the industry. Therefore, given the labor-intensive nature of the hotel business, employees should be considered a key stakeholder along with customers [13]. However, the employee turnover rate in the hospitality industry is exceptionally high within the retail

sector [17], making it harder for the industry to maintain a reliable workforce. CSR activities have been adopted by many hotels in order to maintain their competitive advantage [13], and companies have begun to promote their own superior CSR performance to remain attractive to their employees [18]. Research on employee-related CSR has been receiving less attention compared to the sizable amount of customer-related CSR research. Considering CSR's role in the hotel industry [19], it is critical to understand how employees' perception of CSR can affect their attitudes toward their employers [17].

Despite increasing concerns over CSR and the need to understand CSR perceptions in employees, not much research has been conducted on the relationships between CSR and employee attitudes and behaviors [20]. In particular, the relationship between employee CSR perception and organizational commitment (OC), and the underlying process leading to OC, are even less studied areas [21]. Our research is designed to investigate the relationship between employee CSR perception and OC, and the role of intrinsic motivation as a mediator between them. Motivation is closely related to the sensory formation process directly controlling each member's perception and behavior [22]. How employees respond to a company's CSR, and their willingness to contribute to the organization, may vary depending on motivational factors [23]. In some organizational studies, job level was used as a factor influencing employee attitudes and performance. For example, in a corporate setting, managers and non-managers were found to take on expected and assumed behaviors and beliefs appropriate to their positions within the organization [24], and thus, work-related performance and attitudes could depend on employee position.

To further understand employees' perception of CSR, our research on the Korean hotel industry focuses on the relationships among employees' perception of CSR, their intrinsic motivations, as well as OC. Using stakeholder theory as a theoretical background, this study investigates (1) the relationship between the perceptions of hotel employee-related and customer-related CSR and their intrinsic motivations, (2) the relationship between intrinsic motivation and OC, (3) the intermediate role of intrinsic motivation between CSR perception and OC, and (4) the moderating effect of an employee's job level on the relationship between CSR perception and intrinsic motivation. By doing so, this study attempts to contribute to the existing CSR literature by finding out the underlying influence of South Korean hotel employees' perception of CSR on their own OC.

This study contributes to extending our understanding of the current CSR literature by investigating the influence of employees' CSR perception on intrinsic motivation and OC using stakeholder theory. By investigating how this phenomenon varies depending on the job level of employees, this study can contribute to help hotels better manage their human resources and therefore strengthen their competitiveness. This investigation has a practical significance for the highly competitive Korean hotel industry. This paper is organized as follows. Starting with the introduction, Section 2 provides the background theoretical development and hypotheses of the research, and the methodology of the research including the analysis will follow. Then, a discussion of our findings is presented in Section 4, and the paper ends with the contributions and limitations of our study.

2. Theoretical Development and Hypotheses

Stakeholders are referred to as "those groups without whose support the organization would cease to exist," and Freeman defined them as "those groups who can affect or are affected by the achievement of an organization's purpose" [25]. Stakeholders are therefore essential participants in a company's existence, who play three roles for corporate social performance. Stakeholders are corporate goal-setters who have concrete expectations of performance. Those expectations help the corporation with its CSR direction. As a second role, stakeholders experience the consequences of corporate behavior, which is a passive role. Their third role is as appraisers of corporate behavior, and to fulfill that role, they evaluate their company-related experience and the experience of other stakeholders. Stakeholder theory was initially used in analyzing the external environment and determining organizational capabilities for corporate planning or policymaking [23]. However, stake-

holder theory later became the backbone theory supporting the corporate pro-stakeholder direction. CSR activities have been mentioned with organizational stakeholders including employees, customers, suppliers, and other communities.

A company's CSR activity is defined as "the managerial obligation to take action to protect and improve both the welfare of society as a whole and the interest of the organization" [26]. Freeman and Dmytriyev [27] suggested that CSR activities by a company should be based on the corporate vision and mission statement, and the goal of CSR activities should be creating the most value for corporate stakeholders while ensuring economic sustainability. The stakeholder theory sees that adding more value to one stakeholder will result in overall value to other stakeholders owing to the interdependency among them. The perspective seems to encourage companies to select the recipients of CSR efforts based on the contribution to society [28]. However, when a company weighs claims from multiple stakeholders, the company should decide on the beneficiary of its CSR activities based on power, legitimacy, and urgency [29].

CSR considers some stakeholder value to be more important, and customers and employees are considered key stakeholders of corporations [27,30]. Managing CSR related to employees and customers is both critical and strategic. Employees are an especially vital asset, as well as a key success factor for the company [31], and they embody the main stakeholder group affecting the quality of goods and services [32]. A company's CSR activities are found to boost employees' intrinsic motivations, commitment, trust, improved engagement, workplace culture, and better ethical behavior [33]. Therefore, the implementation of CSR activities leads to positive employees' perception of the workplace, enabling the organization to achieve its desired outcomes and organizational development [34].

Stakeholder perceptions are often used to measure the level of CSR [35]. There are multiple domains that the perception of CSR could cover: customers, employees, environmental groups, suppliers, the local community, society, and shareholders. Perceptions of customer CSR will influence the reputation of a firm and loyalty to the firm [7,8]. While perception can be significantly different from the actual CSR activities of the firm, CSR perception in employees can be valuable in studies on behavioral outcomes from employees [30]. Previous research into employee CSR perception found that when employees perceive corporate CSR activities positively, they engage in work better [36], show higher productivity [37], have increased OC [38], and stay in their jobs longer [39]. In addition, CSR-conscious companies will have a larger potential employee pool and a greater chance of recruiting better employees [17]. Sarfraz et al. [39] suggested that employees' positive perceptions of the firm's CSR initiatives will convince those employees that the firm will practice a positive level of employee CSR as well.

Previous studies used perceptions of CSR to predict customers' and employees' attitudes and behavioral outcomes [30,31,40]. For our study, we adopted and modified the definition of CSR by Davis and Blomstrom [26] in order to define employee perception of customer-related CSR and employee-related CSR. We define employee perception of customer-related CSR as "employees' perception of the managerial obligation to take action to protect and improve the customers' welfare as well as the interest of the company." In addition, we define employees' perception of employee-related CSR as "employees' perception of the managerial obligation to take action to protect and improve the employees' welfare as well as the interest of the company."

2.1. The Relationship between CSR Perception and Intrinsic Motivation

According to Rego et al. [41] the employees' perception of corporate citizenship will improve employee commitment. Similarly, hotel employees' organizational identification is influenced positively by their perception of CSR activities [17]. Higher Common Good Balance Sheet scores for firms are related positively to employee job-related attitudes and behaviors, including identification with the company, increased organizational support, more meaningfulness in their work, and improved organizational citizenship behavior.

Other studies confirmed that the perception of corporate CSR activities by employees enhances employees' OC [31,41,42].

When a specific type of motivation is required, well-designed rewards can induce it [43]. An employee's performance of tasks is based on both extrinsic and intrinsic motivation. Extrinsic motivation is referred to as "the performance of an activity in order to attain some separable outcome" [44], and extrinsic motivators include competitive salary, fringe benefits, and bonuses. Intrinsic motivation is defined as "doing an activity for the inherent satisfaction of the activity itself" and includes enjoyment of the job, the joy of working with coworkers, satisfaction derived from the job, challenges in performing tasks, feeling proud of the company, and other positive, non-monetary rewards [44]. Intrinsic motivation refers to self-driven, voluntary performance of tasks due to enjoyment or joy from the activity itself. While work implies extrinsic rewards, employees' perception of CSR activities is more related to intrinsic motivation [4]. These CSR activities, which originate not from profitability but an investment in morality, are more than sources of expense.

An organization participating in CSR activities is likely to create a positive work environment where employees are intrinsically motivated to work well. According to Deci et al. [43], a meta-analysis of 128 studies showed that positive feedback and self-reported interest influenced intrinsic motivation positively. When an employee finds meaningfulness in work through the company's CSR activities, their intrinsic motivation tends to increase while boosting innovation [45]. Intrinsic motivation mediates the relationship between employees' perception of CSR and creativity [46]. Socially responsible firms influence the intrinsic motivation from employees' willingness to make positive changes to their work environment [47]. In research on a Malaysian banking firm, Jie and Hasan [48] found a moderate and positive relationship between determinants of CSR and intrinsic job motivation. Hence, the following hypotheses were formulated:

Hypothesis 1 (H1a). *Employees' perception of customer-related CSR relates positively to employee intrinsic motivation.*

Hypothesis 1 (H1b). *Employees' perception of employee-related CSR relates positively to employee intrinsic motivation.*

2.2. The Relationship between Intrinsic Motivation and OC

OC and motivation are good predictors of satisfaction and quality of work life [49]. Among the factors concerning organizational performance discussed in previous studies is OC [31]. OC is related to a strong desire to remain a member of an organization, strong confidence in taking on the values and goals of the organization, and a willingness to make considerable efforts for the organization [31]. Thus, employees with great OC tend to put extra efforts into improving the performance of the organization [23].

Because OC is related to organizational outcome, companies need to find ways to strengthen it. Canrinus et al. [50] argued that motivation is one of the important factors determining OC. As motivation affects and determines one's behavior, employees need to sustain their motivation [51]. Chalofsky and Krishna [52] described a deeper level of intrinsic motivation exhibited as the interplay among meaningful work, employee commitment, and employee engagement. Through the processes of identification, congruence, and internalization of the organizational goals and values, employees become committed to the organization; in turn, the organization provides organizational support, creating an environment for the continual fostering of emergent employees, who are intrinsically motivated and engaged with the organization in a most efficient way. Intrinsic motivation is found to have a significant relationship with OC [53]. Therefore:

Hypothesis 2 (H2). *Employee intrinsic motivation relates positively to OC.*

2.3. The Effect of Intrinsic Motivation Mediating the Association between Employees' CSR Perception and OC

According to one previous study on the relationship between employees' perception of CSR changes (general, environment-related, and money-related) and employee commitment, there is a direct and significant effect on commitment from the relationship between the perception of general CSR change and the perception of environment-related CSR change [54]. In fact, employees working for the same company can form a perception of corporate CSR performance in different ways [55]. Employees perceive CSR activities differently due to (1) the degree to which they value the CSR activities and/or (2) the degree to which they are likely to be affected by the CSR activities [56]. If an organization provides CSR activities that employees perceive as valuable, it is likely to increase positive attitudes, including employees' commitment to the organization. In other words, when employees receive benefits from organizations, they tend to feel obligated to show commitment as repayment for the benefits [23]. Thus, how employees perceive CSR can affect their work behaviors, attitudes, and/or commitment [20].

The relationship between CSR perception and OC has been proven in previous studies, as described in the previous paragraph. In the relationship between the two elements, intrinsic motivation can play a mediating role. It is reasonable to expect employees' responses to the company's CSR, and their contributions to the organization, may vary depending on the motivational factors in the employees [23]. Motivation is closely related to the sensory formation process by directly controlling each member's perception and behavior [22]. Perception influences employee behavioral outcomes via intrinsic motivation [46]; therefore, employees' positive CSR perception should strengthen their CSR-induced performance through intrinsic motivation. Intrinsic motivation is a key determinant of employees' behavioral outcomes, and intrinsically motivated employees develop new skills and engage deeply in their work [57]. Within a service such as the hotel industry, the quality of service has a close relationship with OC. Intrinsic motivators, such as positive feedback to employees, empowerment through delegation, and opportunities to learn, influence employees to provide better services to customers through OC [58]. Therefore, the relationship between OC and employees' perceived CSR to customers and to themselves can be affected by the employee's intrinsic motivation. Thus:

Hypothesis 3 (H3a). *Intrinsic motivation mediates the relationship between employees' perception of customer-related CSR and OC.*

Hypothesis 3 (H3b). *Intrinsic motivation mediates the relationship between employees' perception of employee-related CSR and OC.*

2.4. The Moderating Effect of Employees' Job Levels in the CSR–Intrinsic Motivation Link

Previous studies have suggested that job level directly influences work-related attitudes, such as satisfaction, absenteeism, organizational commitment, participation, and more [59]. One of the reasons for this is that employees at different job levels will have different job experiences [60]. For example, managerial employees may face more uncertainty at work and may accept more responsibilities [61], and therefore, the degree of the responsibilities and the work-related attitudes between managerial and non-managerial employees differ. Job level can influence job satisfaction [24], which is closely related to intrinsic motivation [62]; thus, the level of intrinsic motivation could differ depending on the job level.

In a corporate setting, managers and non-managers take on expected and assumed behaviors and beliefs appropriate to their positions within the organization [24]. The employees' needs also reflect different responsibilities and assumed behavior coming with their job levels, and CSR preference was found to be different based on the job level [63]. Researchers found that managers prefer CSR, compared to non-managers, even though there is no opportunity for personal growth. According to role theory, people

show patterned behaviors, take on identities, and perform expected behaviors due to their prescribed social roles [64]. Miles et al. [24] show that supervisors exhibit more positive patterns of communications within their job settings compared to hourly employees. Those patterns allow openness and criticism within the work and predicted job satisfaction only among hourly employees. This shows the following: (1) a higher job level comes with a working condition (certain communication patterns included) which is related with job satisfaction, (2) a lower job level personnel can have a higher degree of job satisfaction given the same working conditions as the higher job levels', and, therefore, (3) job level provides different starting grounds in forming job attitude as well as job perception. Job levels should influence how managers and non-non managers perceive their CSR practices and how they form their motivation regarding the job. Thus, these hypotheses are proposed:

Hypothesis 4 (H4a). *The job level of the employee will moderate the relationship between the employee's perception of customer-related CSR and the employee's intrinsic motivation such that the relationship between the employee's perception of customer-related CSR and the employee's intrinsic motivation is stronger for managerial-level employees than non-managerial employees.*

Hypothesis 4 (H4b). *The job level of the employee will moderate the relationship between the employee's perception of employee-related CSR and the employee's intrinsic motivation such that the relationship between the employee's perception of employee-related CSR and the employee's intrinsic motivation is stronger for managerial-level employees than non-managerial employees.*

Our research model is described in Figure 1.

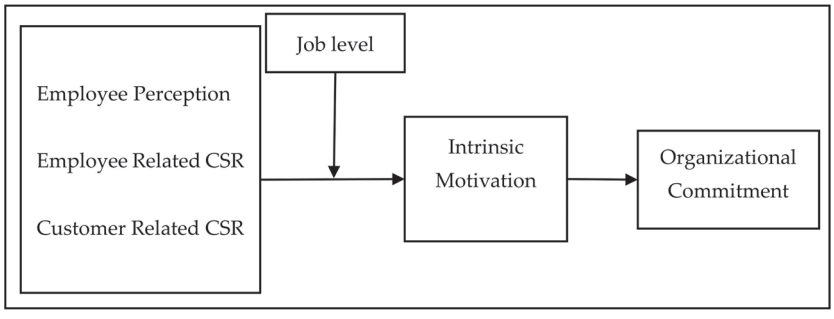

Figure 1. Proposed research model.

3. Methodology

3.1. Data and the Sample

This study was designed to determine the mediation effect from intrinsic motivation on employees' perception of customer- and employee-related CSR and organizational commitment. We also looked at how job level moderates the relationship between employees' CSR perception and their intrinsic motivation. A total of 310 hotel employees in South Korea participated in a survey-based study. The survey was conducted from 28 July 2021 to 5 September 2021. An online link was sent to participants who had worked in a hotel for more than one year. Of them, 184 participants (59.4%) worked in local brand hotels while 126 (40.6%) worked for international brand hotels; 146 participants (47.1%) worked in hotels that had fewer than 100 employees, and 164 (52.9%) worked in hotels that had more than 100 employees. In basic demographics, 138 participants (44.5%) were male and 172 (55.5%) were female, 168 (54.2%) were between 20 and 29 years old, 54 (17.4%) were between 30 and 39 years old, with 70 participants (22.6%) between ages 40 and 49 and 18 (5.8%) between ages 50 and 59. Moreover, 70 participants (22.6%) had worked fewer than 3 years in the hotel, while 240 participants (77.4%) had worked more than 3 years in the

hotel; 184 (59.4%) replied that they worked in non-managerial positions, while 126 (40.6%) held managerial positions.

3.2. Measures

Ratings of employee CSR perception, intrinsic motivation, and OC were based on a five-point Likert scale (1 = not at all likely, 5 = very likely). The section for employee-perceived customer-related CSR listed three items, and the employee-related CSR section listed six items (adapted from Supanti and Butcher [65]). The intrinsic motivation section had three items and was adapted from Kunz [66], while the OC section measured eight items adapted from Youn et al. [67]. The number of employees working at the hotel and the number of years in the business were used as covariates. The number of employees indicated the size of the organizations [68,69], and the firm size influenced the relationship between CSR and performance [70]. Thus, we think CSR perception and OC can be affected by firm size. We included the business period as a control variable because business years influence an organization's CSR-related behavior [71].

To assess the reliability and validity of the variables on the measurements, we used Cronbach's α to test for internal consistency, and we conducted confirmatory factor analysis to demonstrate convergent validity. As shown in Table 1, all measures were found reliable because Cronbach's α exceeded 0.6. In addition, as shown in Table 2, the factor loading of customer-related CSR, employee-related CSR, intrinsic motivation, and OC were all higher than 0.5.

Table 1. Variables and item description.

Variables	Items	Mean (SD)	Factor Loading	References
Employee-related CSR	My company encourages employees to participate in volunteering activities.	3.21 (1.15)	0.75	Supanti and Butcher (2019)
	My company's policies encourage employees to develop their skills and careers.		0.90	
	The management of my company is concerned with employees' needs and wants.		0.82	
	My company implements flexible policies to provide a good work and life balance for employees.		0.90	
	The managerial decisions related to employees are usually fair.		0.90	
	My company supports employees who want to acquire additional education.		0.86	
Customer-related CSR	My company protects consumer rights beyond the legal requirements.	4.06 (0.88)	0.88	Supanti and Butcher (2019)
	My company provides full and accurate information about its products to customers.		0.90	
	Customer satisfaction is highly important to my company.		0.89	
Intrinsic motivation	I would be willing to work diligently in this situation because I enjoy this work very much.	3.80 (1.07)	0.96	Kunz (2020)
	I would be willing to work diligently in this situation because I have fun doing my job.		0.96	
	I would be willing to work diligently in this situation for the moments of pleasure that this job brings me.		0.92	

Table 1. *Cont.*

Variables	Items	Mean (SD)	Factor Loading	References
Organizational Commitment	I talk up my company to friends as a great company to work.	3.25 (0.94)	0.73	Youn et al. (2018)
	I would accept almost any type of job assignment in order to keep working for my company.		0.79	
	I find that my values and the company's values are very similar.		0.88	
	I am proud to tell others that I am part of my company.		0.87	
	My company really inspires the very best in me in the way of job performance.		0.83	
	I am extremely glad that I chose to work for my company over others I was considering at the time I joined.		0.89	
	I really care about the fate of my company.		0.59	
	For me, this is the best of all possible companies for which to work.		0.87	

Table 2. Correlation and reliability analysis.

	Customer-Related CSR	Employee-Related CSR	Intrinsic Motivation	Organizational Commitment	Cronbach's α
Customer-related CSR	1				0.87
Employee-related CSR	0.56 **	1			0.93
Intrinsic motivation	0.54 **	0.40 **	1		0.94
Organizational Commitment	0.50 **	0.57 **	0.62 **	1	0.92

Notes: $n = 310$, ** $p < 0.01$ (two-tailed test).

3.3. Results

We first analyzed whether intrinsic motivation mediates employees' CSR perception and OC. The number of employees working at the hotel and the hotels' operated years were used as covariates. To test proposed hypotheses 1, 2, and 3, model 4 from Hayes' Process macro [72] was used.

As predicted, employees' perception of customer-related CSR related positively to intrinsic motivation (b = 0.63, SE = 0.06, $p < 0.01$, 95% CI [0.51, 0.74]: H1a supported), and intrinsic motivation related positively to organizational commitment (b = 0.431, SE = 0.05, $p < 0.01$, 95% CI [0.32, 0.52]: H2 supported). In addition, the study indicated employees' perception of employee-related CSR related positively to intrinsic motivation (b = 0.37, SE = 0.05, $p < 0.01$, 95% CI [0.27, 0.46]: H1b supported), and intrinsic motivation related positively to organizational commitment (b = 0.39, SE = 0.05, $p < 0.01$, 95% CI [0.32, 0.47]: H2 supported).

Through mediation analysis, we found that both direct effect from the perception of customer-related CSR on organizational commitment (b = 0.24, SE = 0.06, $p < 0.01$, 95% CI [0.14, 0.35]) and indirect effects from customer-related CSR on organizational commitment through intrinsic motivation were significant (b = 0.27, SE = 0.04, 95% CI [0.20, 0.34]: H3a supported), indicating partial mediation (Table 3). Similarly, both direct effect from perception of employee-related CSR on organizational commitment (b = 0.32, SE = 0.04, $p < 0.01$, 95% CI [0.25, 0.39]) and indirect effects from employee-related CSR on organizational commitment through intrinsic motivation were significant (b = 0.14, SE = 0.02, 95% CI [0.10, 0.20]: H3b supported), indicating partial mediation (Table 4).

Table 3. Mediation result (Customer-related CSR -> Intrinsic Motivation -> Organizational Commitment).

	Intrinsic Motivation (M)				Organizational Commitment (Y)			
	Coeff.	**SE**	**t-Value**	***p*-Value**	**Coeff.**	**SE**	**t-Value**	***p*-Value**
Constant	1.25	0.34	3.68	<0.01	0.64	0.29	2.32	0.02
Customer-related CSR (X)	0.63	0.06	10.55	<0.01	0.24	0.06	4.42	<0.01
Number of Employees	0.23	0.10	2.22	0.03	0.05	0.08	0.63	0.53
Company Years	−0.20	0.12	−1.67	0.10	−0.05	0.10	−0.54	0.59
Intrinsic Motivation (M)	-	-	-	-	0.43	0.05	9.48	<0.01
Model Summary	$R^2 = 0.43$	F = 57.29	$p < 0.01$		$R^2 = 0.26$	F = 36.01	$p < 0.01$	

Table 4. Mediation result (Employee-related CSR -> Intrinsic Motivation -> Organizational Commitment).

	Intrinsic Motivation (M)				Organizational Commitment (Y)			
	Coeff.	**SE**	**t-Value**	***p*-Value**	**Coeff.**	**SE**	**t-Value**	***p*-Value**
Constant	2.38	0.32	7.45	<0.01	0.68	0.24	2.85	<0.01
Employee-related CSR (X)	0.37	0.05	7.73	<0.01	0.32	0.04	8.94	<0.01
Number of Employees	0.46	0.11	4.17	<0.01	0.15	0.08	1.95	0.05
Company Years	−0.26	0.13	−2.00	0.05	−0.09	0.09	−1.04	0.30
Intrinsic Motivation (M)	-	-	-	-	0.39	0.04	10.07	<0.01
Model Summary	$R^2 = 0.52$	F = 82.11	$p < 0.01$		$R^2 = 0.60$	F = 57.00	$p < 0.01$	

Next, we examined the moderated mediation model through intrinsic motivation using Hayes' Process macro (model 7) [72]. First, we examined whether job level moderates the intrinsic motivation relationship between employees' perception of customer-related and employee-related CSR. Once again, the number of employees working at the hotel and hotels' operated years were used as covariates. As predicted, job level moderated the relationship between customer-related CSR and intrinsic motivation (b = 0.45, SE = 0.12, $p < 0.01$, 95% CI [0.21, 0.68]: H4a supported). Additionally, job level moderated the relationship between employee-related CSR and intrinsic motivation (b = 0.37, SE = 0.10, $p < 0.01$, 95% CI [0.17, 0.56]: H4b supported).

The post-doc test indicated that when customer-related CSR is low, the level of intrinsic motivation will not differ between managerial and non-managerial employees (non-managerial = 3.27, managerial = 3.12, $p = 0.40$, 95% CI [−0.44, 0.17]). However, when customer-related CSR is high, the level of intrinsic motivation will significantly differ between managerial and non-managerial employees (non-managerial = 4.03, managerial = 4.67, $p < 0.01$, 95% CI [0.36, 0.91]). In addition, when employee-related CSR is low, the level of intrinsic motivation will not differ between managerial and non-managerial employees (non-managerial = 3.42, managerial = 3.24, $p = 0.71$, 95% CI [−0.39, 0.27]). However, when employee-related CSR is high, the level of intrinsic motivation will significantly differ between managerial and non-managerial employees (non-managerial = 4.03, managerial = 4.67, $p < 0.01$, 95% CI [0.41, 1.02]) (See Figure 2).

Through moderated mediation analysis, we found that both the direct effect of customer-related CSR job level on organizational commitment (b = 0.24, SE = 0.06, $p < 0.01$, 95% CI [0.14, 0.35]) and indirect effect of customer-related CSR job level on organizational commitment through intrinsic motivation are significant (Index: 0.19, SE = 0.06, 95% CI [0.09, 0.32]), indicating partial mediation (Table 5). Similarly, both the direct effect of employee-related CSRjob level on organizational commitment (b = 0.32, SE = 0.04, $p < 0.01$, 95% CI [0.25, 0.39]) and the indirect effect of customer-related CSR job level on organization commitment through intrinsic motivation are significant (Index: 0.14, SE = 0.05, 95% CI [0.05, 0.24]), indicating partial mediation (Table 6).

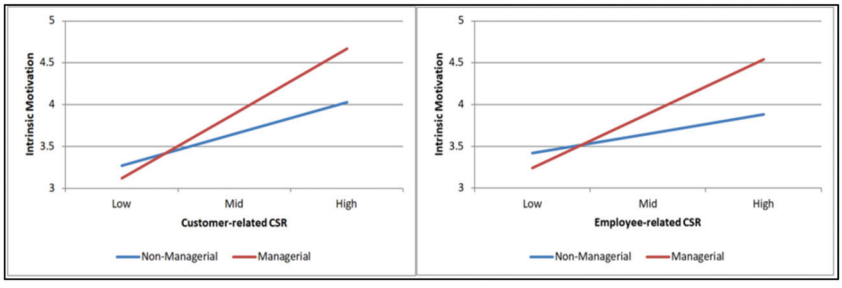

Figure 2. Intrinsic motivation based on employees' perception of customer- and employee-related CSR and job level.

Table 5. Moderated mediation result (Customer-related CSR × Job Level -> Intrinsic Motivation -> Organizational Commitment).

	Intrinsic Motivation (M)				Organizational Commitment (Y)			
	Coeff.	**SE**	**t-Value**	***p*-Value**	**Coeff.**	**SE**	**t-Value**	***p*-Value**
Constant	4.01	0.27	14.88	<0.01	1.63	0.27	5.96	<0.01
Customer-related CSR (X)	0.62	0.06	10.54	<0.01	0.24	0.06	4.42	<0.01
Job Level (W)	0.24	0.11	2.25	0.03	-	-	-	-
Customer-related CSR × Job Level	0.45	0.12	3.77	<0.01	-	-	-	-
Number of Employees	0.15	0.11	1.40	0.16	0.05	0.08	0.63	0.53
Company Years	−0.27	0.12	−2.29	0.02	−0.05	0.10	−0.54	0.59
Intrinsic Motivation (M)	-	-	-	-	0.43	0.05	9.48	<0.01
Model Summary	$R^2 = 0.35$	F = 32.93	$p < 0.01$		$R^2 = 0.43$	F = 57.29	$p < 0.01$	

Table 6. Moderated mediation result (Employee-related CSR × Job Level -> Intrinsic Motivation -> Organizational Commitment).

	Intrinsic Motivation (M)				Organizational Commitment (Y)			
	Coeff.	**SE**	**t-Value**	***p*-Value**	**Coeff.**	**SE**	**t-Value**	***p*-Value**
Constant	3.79	0.29	14.88	<0.01	1.70	0.24	7.10	<0.01
Employee-related CSR (X)	0.35	0.05	10.54	<0.01	0.32	0.04	8.94	<0.01
Job Level (W)	0.24	0.12	2.25	0.03	-	-	-	-
Employee-related CSR × Job Level	0.37	0.10	3.77	<0.01	-	-	-	-
Number of Employees	0.37	0.11	1.40	0.16	0.15	0.08	1.95	0.05
Company Years	−0.27	0.13	−2.29	0.02	−0.09	0.09	−1.04	0.30
Intrinsic Motivation (M)	-	-	-	-	0.39	0.04	10.07	<0.01
Model Summary	$R^2 = 0.26$	F = 21.09	$p < 0.01$		$R^2 = 0.52$	F = 82.11	$p < 0.01$	

4. Discussion

The results of our study show that employees' perception of customer-related CSR and employee-related CSR influences employees' intrinsic motivation positively (H1a and H1b). Similar to our results, Kunz hypothesized that a firm's engagement in CSR activities will foster an optimal environment for intrinsic motivation [66], a place that feels caring and relationship-forming, and found a significant influence from CSR on intrinsic motivation. However, there is research showing conflicting results. For example, Khan et al. [73] found no influence from internal CSR on intrinsic motivation but found a positive and significant influence between external CSR and intrinsic motivation. Our research measured employees' CSR perception, rather than actual CSR practices, so the difference might have resulted in the conflict. Another reason might be that economic and cultural factors (Pakistan vs. South Korea) could produce different results. The relationship between

corporate CSR and intrinsic motivation has not been researched fully [66], and there is a need to verify the relationship in future research.

Intrinsic motivation was found to influence OC (H2). OC refers to a psychological connection between an employee and an organization, and it influences the willingness of the employee to put in extra effort for the organization's cause, creating a desire to stay in the organization, and identification with the core values and goals of the organization [52]. The results of our research show the direct relationship between intrinsic motivation and OC, which is obvious considering the close conceptual relationship between the two.

Intrinsic motivation as a mediator between the employee perception of CSR and OC was proven by this study (H3a and H3b). Similar research by Hur et al. [46] was based on hotel employees in South Korea, and their results showed that intrinsic motivation and compassion at work fully mediated the relationship. The hotel industry is among the worst industries in terms of employee retention, with rates running double the national average in the U.S. for more than a decade [74]. The strategic management of human resources is critical within a labor-intensive industry, where the value of the service is reliant upon workers' skill sets [63]. Companies practicing CSR are found to attract and keep employees even at lower monetary compensation [75]. Therefore, enhancing the CSR perception can be beneficial in managing human resources in an industry with a high turnover rate.

We tested the moderating influence of job level on the relationship between employees' CSR perceptions and intrinsic motivation (H4a and H4b) and found the interaction to be strong. When CSR perception is high (in both customer-related and employee-related CSR), managers demonstrated significantly higher intrinsic motivation. According to role theory, people show patterned behaviors, assume identities, and perform expected behaviors according to their prescribed social roles based on norms, beliefs, and attitudes [64]. In the corporate setting, managers and non-managers would take on expected and assumed behaviors and beliefs appropriate to their positions within the organization [24]. The results of the study suggest that non-management employees would have a positive work attitude from their jobs when they can enjoy a more positive organizational culture—in this case, a culture promoting CSR activities as an environment to enhance employees' social roles.

This result indicates that it is particularly important for managerial-level employees to understand CSR activities in the organization. Compared to non-managerial-level employees, these employees are more motivated and committed to their organizations when they positively perceive CSR activities in their organizations. Hotel managers should design their CSR training programs and information sessions focusing on these managerial position employees. For non-managerial employees, empowering them is crucial. Hotels can make them feel empowered by restructuring their organizations. The delegation of power to lower-level employees will also encourage them to feel more in control, which can induce higher level of motivation and organizational commitment when they perceive CSR activities of the organization. These employees can enhance customer satisfaction by delivering quality service and building strong relationship with their customers. Eventually, the result demonstrates that it is necessary for hotels to apply differently depending on employees' job level as a way to bring positive results for CSR activities, and CSR activities become preconditions to provoke a positive response among stakeholders [76]. All the hypotheses were supported, and employees' perception of customer-related CSR and employee-related CSR both had significant influences on intrinsic motivation as well as OC. The indifferent results between customer-related CSR and employee-related CSR could be due to both perceptions being those of the employees. Therefore, irrespective of the stakeholder benefits from the CSR activities, we believe CSR perception represents the cultural atmosphere of the hotels the employees are working in. How employees perceive the environment is highly related to their innate enjoyment of tasks at work as well as their commitment to their work.

This study tested the mediation effects of intrinsic motivation on hotel employees' perception of customer-related and employee-related CSR and organizational commitment. In addition, as a moderator, job level was selected and tested in the relationship between

employees' CSR perception and their intrinsic motivation. All hypotheses were supported, showing the roles of intrinsic motivator and job level as mediator and moderator, respectively. An intrinsic motivator is typically not tied to tasks in a job-related setting, since intrinsic motivation requires internalization of the tasks and an environment providing joy and pleasure [44]. However, a workplace perceived as one with a CSR culture seems to meet the requirements for intrinsic motivation to thrive. Commitment that is closely related to intrinsic motivation should make an employee want to stay with the company because of job satisfaction, sharing organizational goals, and valuing the organization's success.

While there are many stakeholders of a corporation, this research focuses on employees as the stakeholder of interest. The service industry, especially the hospitality industry, is reliant upon employees as the main producer and deliverer of services. Within the hotel and casino industry, CSR is found to influence both the short-term profit and the long-term profitability of companies [77]. Therefore, the quality of human resources, as well as the instilled ethical values and processes within the organization, would be essential in maintaining competitive advantages within the industry.

5. Contributions and Limitations

This paper contributes to the existing CSR literature by confirming a mediating process and identifying a moderating process in the links among CSR perception, intrinsic motivation, and OC. The findings indicate the critical role of intrinsic motivation in the association between CSR perception and OC. Although some research identified a relationship between CSR activities and employee motivation, the mediating role of intrinsic motivation is still worth investigating in relation to OC. Moreover, the job level will function as a critical moderating factor to explain the link between CSR perception and intrinsic motivation. Job level has been investigated in relation to employee job satisfaction [59]; however, no study could be found that tested the moderating effect of job level in the context of CSR and intrinsic motivation. In addition, the results of this study enhance the understanding of CSR based on the stakeholder theory.

Regarding practical implications, hotels need to recognize that employees (a key stakeholder group) can form OC through their intrinsic motivation. Previous studies indicate that enhancing employees' intrinsic motivation can make employees willingly create a good working environment [47]. Our study shows that enhanced intrinsic motivation enables a higher level of OC, which will eventually reduce the turnover rate of employees [51]. From the perspective of employees as well as their employers, intrinsic motivation can enhance positive service performance and result in a positive human management practice, respectively [78].

Additionally, management in the hotel industry needs to enhance CSR perception among employees, because it brings better motivated and engaged employees. Firms can inform and educate their employees about CSR activities for building better perception of the firm's CRS practices, and hotel owners and CSR managers need to design their internal corporate communication for better CSR recognition. The role of CSR perception can benefit beyond employees and the employers. Customers will receive quality service and more accurate information by interacting with motivated and committed employees [78]. Hence, organizations that can retain employees who are knowledgeable and motivated can have a competitive advantage in human resources within the hospitality industry [79]. Furthermore, non-imitable competitive advantages can lead to an organization's profitability [80].

This study contributes to current knowledge of CSR, and provides practical implications to hoteliers, but there are several limitations. First, this study was conducted with South Korean hotel employees. For generalizability, future studies can be designed for other industries across different nations. Second, OC can be divided into different types of commitment (normative, continuance, and affective [81]), but this study employed overall OC singularly. Further studies are required to test whether CSR perception has the same effect on different types of OC. Third, we used only intrinsic motivation as a mediator. Extrinsic motivation, or both intrinsic and extrinsic motivation, might mediate the relation-

ship between CSR perception and OC even better. According to a study by Deci et al. [43], positive feedback and self-reported interest influenced intrinsic motivation positively; however, intrinsic motivation was lowered significantly when various types of extrinsic rewards were given. Therefore, further research is required to identify the role of extrinsic motivation and to differentiate between intrinsic motivation and extrinsic motivation as mediators. Finally, we used perception of employees to measure customer-related as well as employee-related CSR. The perceptions of employees could be biased due to their roles as employee or their sense of belongingness to the company. Introducing the customer perception for customer-related CSR, or using more accurate measures of employee CSR and customer CSR, could bring a more relevant picture of the role that CSR plays on OC.

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An Empirical Study on How Livestreaming Can Contribute to the Sustainability of Green Agri-Food Entrepreneurial Firms

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Abstract: During the COVID-19 pandemic, digital technology has been used in all aspects of the agricultural field. How to seize the opportunity to achieve the production-marketing connection is increasingly becoming a top concern for green agri-food enterprises. Based on the theory of a task–technology fit, this study analyzes the fitness between livestreaming e-commerce and green agri-food. More specifically, the task characteristics cover the seasonality, locality, and eco-friendliness of green agri-food, and the technology characteristics cover the responsiveness, interactivity, and entertainment of livestreaming e-commerce. Using data of a sample of 574 green agri-food entrepreneurial firms collected through a web-based questionnaire, we preform structural equation modeling (SEM) analysis and find that the locality and eco-friendliness of green agri-food, the responsiveness, interactivity, and entertainment of livestreaming e-commerce have a positive effect on the fit of green agri-food livestreaming e-commerce. Moreover, the fit of green agri-food livestreaming has a positive effect on firm performance and the intention to adopt livestreaming e-commerce. This study also demonstrates that perceived corporate social responsibility has a moderating effect on the relationship between the fit of livestreaming of green agri-food and the intention to adopt livestreaming e-commerce. This study extends prior research on the task–technology fit into livestreaming e-commerce companies and provides insights into our understanding of successful adoption of livestreaming e-commerce.

Keywords: task–technology fit theory; green agri-food firm; livestreaming e-commerce; adoption; firm performance; corporate social responsibility

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1. Introduction

With the improvement in the consumption level and green consumption awareness, consumers began to prefer green agri-food [1,2]. However, due to the outbreak of COVID-19, field procurement vehicles could not enter the production area, which has hindered the traditional marketing model of 'unified purchase of origin—transit in the farmer's market—distribution to major supermarkets'. Therefore, offline sales of agri-food were prohibited in different regions to varying degrees. As a result, there had been increasing concerns regarding the production and marketing connection of agri-food.

Driven by the growth trend of livestreaming economy, many e-commerce platforms, short video platforms, social platforms, and other e-commerce companies are working hard on the livestreaming commerce. Nowadays, large plantation families are also using livestreaming commerce to broaden new marketing channels for agri-food. However, the livestreaming of agri-food is facing problems such as content homogeneity, vulgarity, and streamers with different educational backgrounds. To a certain extent, these issues have affected the consumers' overall impression of the livestreaming of agri-food. In addition, they have a negative effect on the e-commerce companies' sustainable livestreaming business. On the other hand, with the rapid development of e-commerce, many problems such as false sales and shoddy goods continue to appear. The waste and environmental

pollution caused by excessive packaging and the poor working environment of express workers have been gradually severe [3,4]. Therefore, the voices that require e-commerce companies to strengthen corporate social responsibility are becoming louder [5,6].

In the academic field, previous livestreaming studies mainly focused on user purchase decision [7–13], user participation [14–18], use motivation for livestreaming [19], customer relationship management under livestreaming [20], and livestreaming and marketing performance [21]. In the field of agri-food marketing and livestreaming adoption, no relevant research exists on livestreaming that promotes the marketing of agricultural products. Furthermore, in the study on CSR of e-commerce companies, in addition to urging the establishment of e-commerce compliance, improving the quality of e-commerce platform information and accelerating the construction of corporate ethics and ethics [20–23], there are still many deficiencies in the study on user perception of CSR. Therefore, our research is motivated to contribute to the literature related to the marketing of green agri-food and provides an answer to a question of whether livestreaming for agri-food marketing from the perspective of green agri-food firm level is appropriate. In addition, this study aims to evaluate the effectiveness of social responsibility in livestreaming e-commerce of green agri-food and provides a theoretical basis for the sustainable development of livestreaming e-commerce of green agri-food.

Our study offers three contributions to the literature. First, we provide a rigorously derived estimate of how various green agri-food attributes and livestreaming features may shape the overall degree of task–technology fit, which may in turn contribute to the intention of green agri-food entrepreneurial firms to adopt livestreaming e-commerce and their firm performance. By doing so, we provide an important contribution to the livestreaming research by identifying and empirically examining specific product- and technology/service-related features that influence the task–technology fit which then enables firms to adopt livestreaming e-commerce. Second, we examine how much stronger the relationship between task–technology fit and the intention of green agri-food entrepreneurial firms to adopt livestreaming e-commerce is when these entrepreneurial firms engage in more CSR activities. We thus offer preliminary evidence regarding the importance of implementing nonmarket strategies by identifying how the engagement of CSR shapes the potential effect of task–technology fit on the intention of green agri-food entrepreneurial firms to adopt livestreaming e-commerce. Furthermore, we contribute to the development of theory and methodology in the livestreaming e-commerce research by integrating product attributes, technology features, nonmarket strategic choices, e-commerce adoption, and firm performance and highlight a critical link between these bodies of research. We believe this study was one of the first efforts to develop and examine a structural equation modeling that connects various factors. Overall, we believe that this study may provide new insights on how to better motivate entrepreneurial firms to adopt livestreaming e-commerce and how to enhance their performance. We hope that our study can inspire future research to further investigate mechanisms that motivate entrepreneurial firms to adopt new service or platforms such as livestreaming e-commerce.

2. Literature Review and Hypothesis Development

2.1. Task–Technology Fit Theory

In 1995, Goodhue and Thompson proposed the TTF theory, which predicted the adoption of technology and performance through task characteristics, technical characteristics, and TTF [22]. According to TTF theory, the effect of new technology on performance depends on whether the technology used can fit the task to be completed, which reflects how important the TTF is in performance. Moreover, Goodhue and Thompson also emphasized that detailed information technology and user task can better reflect the corresponding relationship between technical performance and user needs.

In recent years, TTF theory has been widely used in the study of new technology adoption willingness, such as e-commerce, Internet of Things, AI, cloud mobile services, and so on [23–29]. TTF theory demonstrates a good explanatory capability in explaining

the TTF and technology adoption. This study uses TTF theory to explain and analyze the fit between the marketing characteristics of green agri-food and the technology of livestreaming e-commerce and to understand the effect of the fit on firm performance and intention to adopt. Considering that the livestreaming technology is provided by a third-party e-commerce company. The study adds CSR as a moderating variable based on the original TTF model framework to investigate how an e-commerce company would fulfill its CSR by livestreaming green agri-food. Figure 1 presents the theoretical model upon which this empirical study is based.

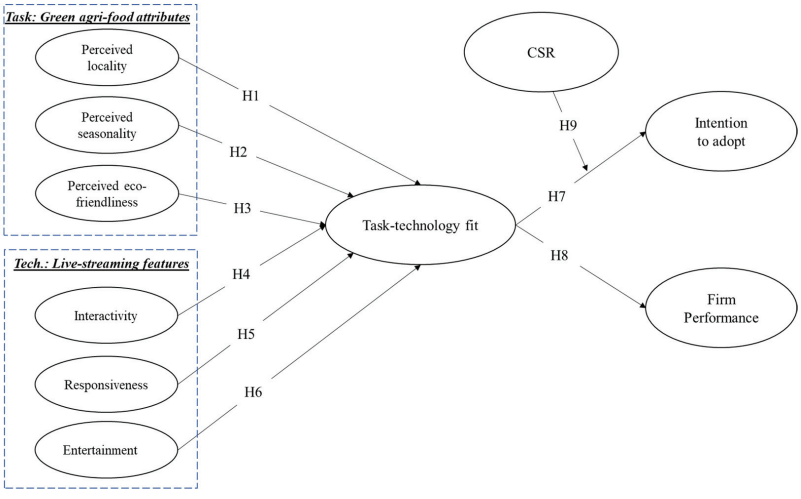

Figure 1. Conceptual model.

2.2. Task Characteristics of Green Agri-Food

According to TTF theory, the task refers to the action taken by individuals to transform input into output [22]. As general agricultural products, green agri-food have the local and seasonal characteristics. The plantation and marketing of green agri-food are cyclical and seasonal [30]. The marketing pressure of agricultural products is high during the harvest season, while it is relatively small during the nonharvest season. In addition, consumers are more likely to buy seasonal agricultural products because they believe that the seasonal agricultural products are more nutritious and safer [31–34]. Therefore, in the marketing of green agri-food, it is important to overcome the seasonal limitations to achieve production and sales. Moreover, green agri-food has obvious local characteristics, and they can only be grown in places that fulfill their soil and climatic conditions. Research shows that people think that agricultural products with local characteristics are fresher and healthier [31,35]. We made it our top priority to overcome the seasonal and local limitations of green agri-food in marketing.

Furthermore, in the marketing of agricultural products, green agri-food are organic, environment-friendly, and pollution free. In the production of green agri-food, environmental protection and quality of agricultural products are emphasized, pure naturalness is stressed, and artificially added chemical ingredients such as pesticides, fertilizers, and herbicides are prohibited. Eco-friendliness has a positive effect on consumer preference [2,31,32,36,37]. Consumers generally believe that green agri-food are environmentally friendly, healthy, and safe [37,38]. On the other hand, in the process of marketing, eco-friendliness of green agri-food cannot be directly conveyed to consumers. Due to the asymmetry of agricultural product information between sellers and buyers, a lack of trust toward green agri-food exists [39]. To demonstrate the eco-friendliness of green agri-food and the eliminate consumers' doubts effectively, it is urgent to introduce new technologies

to fit the marketing of green agricultural products. Therefore, the eco-friendliness of green agri-food is likely to become another task of this study.

Traditional e-commerce platforms cannot fully reflect the seasonal, local, and eco-friendliness characteristics of green agri-food. No timely, true, and effective marketing channel can reflect the characteristics of green agri-food in the process of marketing. The livestreaming technology directly connects consumers and products, restores the product information to the greatest extent, and provides users with a sense of reality: that is, what you see is what you get [7,8,16]. We expect that in the marketing of green agri-food, the seasonal, local, and eco-friendliness characteristics of green agri-food advance the fit of marketing and livestreaming. Thus, this study proposes the following hypotheses:

Hypothesis 1. *The locality of green agri-food has a positive effect on the fit of livestreaming of green agri-food.*

Hypothesis 2. *The seasonality of green agri-food has a positive effect on the fit of livestreaming of green agri-food.*

Hypothesis 3. *The eco-friendliness of green agri-food has a positive effect on the fit of livestreaming of green agri-food.*

2.3. Technology Characteristics of Livestreaming

According to TTF theory, technology refers to the tools used by individuals when they perform tasks. In terms of information system, technology includes computer systems and other supporting services that help users in complete tasks [22]. In the study, technology refers to livestreaming e-commerce technology. The livestreaming e-commerce technology combines the network platform and the livestreaming technology, providing a type of service whose data can be distributed simultaneously when the data are created [40]. The livestreaming e-commerce technology features interactivity, responsiveness, and entertainment [17,41].

Interactivity is a kind of communication technology, that is, to what extent that it supports information exchange and communication among people [42]. Interactivity is an important feature of e-commerce, which can help consumers control information when they lack experience on products [43]. The interactivity of livestreaming e-commerce includes not only the interaction between sellers and buyers but also the interaction among buyers or online shoppers [44,45]. Sellers answer the buyers' questions through livestreaming and displays the products according to the buyers' requirements. Online shoppers can also share shopping experiences for feedback and deliver more shopping information, which would help reduce the consumers' uncertainty in purchasing products and help potential consumers make better decisions [45,46].

The second characteristic of livestreaming e-commerce is responsiveness, which is combined with real-time interaction and e-commerce. Responsiveness is how the livestreaming e-commerce companies respond to the users' request, that is, how fast the seller and the user receive a quick response from the other party in the livestream [17,47,48]. The seller can control the product information and the users' consultation information in the livestream room in real time and make corresponding responses. Timely responses not only include the response to product details, on-site trials, and so on, but also real-time responses to streamer's facial expression, eye, and body language. This responsiveness conveys a wealth of information, which effectively reduces the consumers' shopping risks, increases the consumers' perception of the usefulness of commodities, and narrows the psychological distance between consumers and businesses [17,49].

Entertainment is also a major feature of livestreaming e-commerce [17]. Livestreaming e-commerce provides traditional e-commerce services, and the real-time and rich interactive function makes marketing itself more fun and helps buyers and sellers conclude transactions with pleasure. Sellers display agricultural products in a relaxed and pleas-

ant way, such as planting field, agricultural product picking, and processing. On the other hand, interesting interactive elements, such as grabbing red envelopes, barrage chat, bullet screen, and giving virtual gifts would enhance the usefulness of live e-commerce, shorten the psychological distance between sellers and buyers, and provide immersive and pleasurable shopping experience for users [17].

In the marketing process, to display the seasonal, local, and eco-friendliness of green agri-food, as well as reduce the uncertainty and risk in the consumption of green agri-food, a timely, credible, and verifiable marketing is needed. Moreover, Tajvidi et al. [50] and Lin et al. [51] have suggested that social commerce provides a good communication channel for the establishment of relationships between businesses and users. Active information sharing between users and merchants can enhance trust in social commerce, which in turn increases the level of satisfaction toward social commerce. Perceiving the characteristics and role of live e-commerce can improve the sense of fit in livestreaming marketing of green agri-food products. Therefore, this study predicts that the interactivity, responsiveness, and entertainment of livestreaming can fit the marketing task of green agri-food. The interactivity, responsiveness, and entertainment of livestreaming e-commerce have a positive effect on the fit of livestreaming e-commerce of green agri-food. Thus, this study proposes the following hypotheses:

Hypothesis 4. *The interactivity of livestreaming technology has a positive effect on the fit of livestreaming of green agri-food.*

Hypothesis 5. *The responsiveness of livestreaming technology has a positive effect on the fit of livestreaming of green agri-food.*

Hypothesis 6. *The entertainment of livestreaming technology has a positive effect on the fit of livestreaming of green agri-food.*

2.4. Task–Technology Fit, Technology Adoption, and Performance

TTF refers to what extent that technology helps individuals in performing their tasks. In view of TTF theory, TTF can not only increase the users' intention to adopt technology but also improve task performance [22]. The findings have been verified in many fields. In the field of social media and emergency management, the mobility of social media is fit for individuals who are seeking and sharing information and communicating with others in emergency situations. The TTF positively affects the intention to adopt mobile social media and improves the efficiency of completing tasks [52]. Shoppers perceive that technologies such as robotic shopping assistants, parcel storage cabinets, and drone deliveries can fulfill the shoppers' need for noncontact shopping, wherein the stronger the sense of fit is, the higher the willingness of adopting these technologies would be [25]. In the application of cloud mobile retail, sellers perceive that cloud mobile retail technology can help them manage orders in various regions. The stronger the fit between cloud mobile retail technology and order management task is, the greater the willingness of sellers to adopt cloud mobile retail technology and the higher the efficiency of order task completion would be [53]. In the research of IoT technology and disaster rescue management, scholars have confirmed that the information collection, transmission, and processing technology can help them analyze and understand the disaster scenes in the formulation of rescue plans. The fit of rescue missions and IoT technology can increase the adoption of IoT technology and improve the performance of rescue missions [24]. In the field of livestreaming, livestreaming technology promotes interaction between users, creates a pleasant marketing environment for sellers and shoppers, and increases the sales of experiential products [54].

In view of this, we speculated that the fit of green agri-food and livestreaming positively affects the intention to adopt livestreaming and firm performance. The greener agri-food companies perceive that the fit between green agri-food marketing and livestreaming

e-commerce technology, the stronger the willingness to adopt the livestreaming technology is, and the higher the firm performance would be. Thus, the study puts forward the following hypothesis:

Hypothesis 7. *The fit of livestreaming of green agri-food has a positive effect on the intention to adopt livestreaming e-commerce.*

Hypothesis 8. *The fit of livestreaming of green agri-food has a positive effect on the firm performance of green agri-food enterprise.*

2.5. Corporate Social Responsibility

Carroll (1979, 1991) used a four-frame pyramid to describe the components of CSR, which were economic, legal, moral, and charitable responsibilities. Among them, economic responsibility is at the bottom, which accounted for the largest proportion, followed by legal responsibility, moral responsibility, and charity responsibility. In the process of assessing CSR, Carroll determined that the social problem approach can be used to strengthen the relationship between corporate and society, reflecting the importance of social issues [55,56].

In recent years, social problems such as environmental deterioration and the wealth gap have been prominent, and the proportion of social and environmental responsibility in CSR has gradually increased. The European Commission stated in the Green Paper on Corporate Responsibility that companies should incorporate social and environmental responsibilities into their own business operations and interactions with relevant stakeholders, emphasizing that companies must perform their social and environmental responsibilities. E-commerce companies possess advanced technologies and a large amount of consumer data, and the fulfillment of social responsibilities by e-commerce companies can not only increase the users' trust and loyalty to the companies but also enhance corporate image [57,58].

Consumers evaluate CSR, and the results of the evaluation directly affect the consumers' willingness to consume [59–61]. When users perceive a strong sense of CSR, once the technology provided by a company fulfills the needs of consumers, the consumers' willingness to adopt the technology becomes stronger. Thus, when green agri-food firms perceive that e-commerce companies have a strong sense of CSR, they are willing to adopt e-commerce technologies as long as the livestreaming technologies provided by e-commerce companies would advance the marketing tasks of green agri-food. By contrast, when the sense of CSR is weak, the livestreaming technology is evaluated in time to support the marketing tasks of green agri-food, and the intention to adopt it is weak. The perception of CSR plays a moderating role between the fit of livestreaming of agri-food and the intention to adopt livestreaming. Therefore, the study proposes the following hypotheses:

Hypothesis 9. *The perception of CSR of livestreaming e-commerce moderates the relationship between the fit of livestreaming of green agri-food and the intention to adopt livestreaming e-commerce.*

3. Methodology

3.1. Sampling and Data Collection

We test our hypotheses on a sample of entrepreneurial firms from the Chinese agricultural industry. China provides an ideal research setting to empirically explore what motivates rural entrepreneurial firms in the agricultural industry to employ livestreaming on certain online platforms to sell their agricultural products and how these firms can achieve better performance outcomes by successfully creating a task–technology fit and engaging in CSR for the following reasons. With the successful digital transformation and development of digital economy, China has rapidly emerged as both the world's largest e-commerce market and biggest retail e-commerce market over the last decade. The country

now accounts for more than half of the worldwide online retail sales. According to the E-Commerce in China 2019 report released by China's Ministry of Commerce (MOFCOM), the e-commerce industry in China has achieved above-average growth over the past few years, and the total transaction volume of e-commerce in China reached approximately 35 trillion yuan (approximately USD 5 trillion using the official exchange rate) by the end of 2019. The online retail sales reached more than 10 trillion yuan (approximately USD 1.5 trillion). According to the 45th Statistical Report on the Development of China's Internet released by China Internet Information Center (CNNIC) , there were more than 700 million online shoppers in China in 2019, and more than 37% of the online shoppers (2.65 million consumers) experienced shopping through e-commerce livestreaming. As reported by iiMedia Research, a market consultancy, the livestreaming e-commerce market in China achieved an annual growth of more than 121% reaching 961 billion yuan (approximately USD 138 million) in 2020. Despite the rapid emergence and development of the livestreaming e-commerce industry in leading the recent e-commerce sales and its powerful effect on the whole digital economy of China, it has barely touched the agricultural industry, which may be one of the least innovative sectors in China. Amid slowing economic activity, COVID-19 has accelerated the growth of China's emerging livestreaming e-commerce in the agricultural industry, offering new growth opportunities for a wide range of farming business operators. Livestreaming has become a popular means for rural entrepreneurial firms. Smaller business operators in the agricultural industry can have better access to consumers to promote and boost the sales of their agricultural products. For example, there were more than 50,000 rural livestreamers on Taobao live by the end of first quarter of 2020. This number is roughly 49 times bigger than that in 2019 (1000). One million livestreaming sessions were held on Taobao Live, the livestreaming unit of the largest e-commerce platform in China operated by the Chinese e-commerce giant, Alibaba Group, during the third Chinese Farmer's Harvest Festival between September 22 and 24 in 2020. The livestreaming technology is rapidly creating a direct farm-to-kitchen business model for rural entrepreneurial firms operating farming business in the Chinese agricultural industry.

To collect data from rural entrepreneurial firms in the agricultural industry, we employed a survey in two regions of China: Zhejiang and Jiangsu. These two regions have seen explosive growth of the livestreaming e-commerce market. More importantly, they represent the most important and popular areas of the country for livestreaming e-commerce in the agricultural industry. To develop the questionnaire for the study, we followed a careful process by first developing an English version of the questionnaire and then translating it into Chinese with the help of two independent bilingual translators. To ensure conceptual equivalence and accuracy, the Chinese version of the questionnaire was back-translated into English by two additional independent translators who are competent in Chinese and English [62]. To ensure the content and validity of the measures to understanding the latest focal livestreaming phenomenon, we conducted five online in-depth interviews with five managers of firms actively engaging in livestreaming platforms to promote and sell their agricultural products. We then pilot-tested our survey instruments with 20 rural entrepreneurial farming business operators in the agricultural industry. Based on the feedback from the interviews and pilot tests, we further modified a few questionnaire items to ensure their relevance and clarity of the questionnaire items. Prior research has demonstrated the potential challenges faced in collecting sufficient primary firm data in China and argued for the importance of using guanxi (i.e., developing good relationship and trust) to increase high-quality responses [63]. Following the recommendation to encourage survey participation and enhance high-quality response rate, we administered the survey with the help of a renewed research company in the Chinese local market. Finally, we collected a total of 602 questionnaires. After excluding 28 irrelevant or incomplete responses, we received a total of 574 completed and usable questionnaires that are utilized for the final data analysis. Of the 574 argi-food entrepreneurial firms, most (80.7%) had less than 100 employees, and 78.6% had annual sales revenues of less than 1.5 million RMB. On

average, the respondents had been working for 9.6 years in the industry and 4.8 years with their firm.

3.2. Bias Testing

To verify the presence of nonresponse bias in the data that may possibly influence our statistical results, we compared the differences between the responding and nonresponding firms as well as the firms that responded to our survey early against those that responded late on key firm characteristics (e.g., firm sales, number of employees, and age). To check for this potential threat to validity, we considered the early-responding firms as the proxy for responding firms and the late-responding firms as the proxy for nonresponding firms under the assumption that the firms responded late are more similar to nonresponding firms than those responded early to those nonresponding ones [64]. Our results of a test show that there was no statistically significant difference between the firms that responded to our survey early and those that responded late on firm sales, number of employees, and firm age, suggesting no evidence of a serious concern on response bias in our data [64]. In addition, it has been suggested that the analysis of self-report survey data may suffer from potential common method variance (CMV). However, we do not believe that CMV is a significant problem in our study for several reasons. First, to mitigate a simple 'straight line' pattern of response, we separated the measures of our constructs into several subsections and used different formats when designing our questionnaire [65,66]. Second, to reduce the potential presence of CMV-biased response patterns, we randomized the order of the questions on the questionnaire using survey software and reversed the scaling on several questions. More importantly, all respondents were promised a strict anonymity and confidentiality of their responses in the survey cover letter. In particular, they were assured that the survey was only for the sake of academic research and that there were no right or wrong answers to the questions and they should simply respond to each question as honestly as possible. Nevertheless, we performed Harman's one-factor analysis, as recommended by Podsakoff, MacKenzie, Lee, and Podsakoff (2003), to assess the potential CMV concern in our data [67]. In doing so, we performed exploratory factor analysis by entering the variables in the study into a nonrotated factor analysis, and the results of the one-factor analysis indicate that no general factor is apparent in the unrotated factor structure and accounted for a majority of the variance. These results suggest that CMV should not be a significant concern in our data.

3.3. Variables and Measurement

Unless noted otherwise, all the dependent, independent, and moderating variables in the study were assessed using multiple-item, seven-point Likert scales ranging from "strongly disagree" (1) to "strongly agree" (7).

To develop the measure of the perceived eco-friendliness feature of agricultural products, we used four times derived from prior theoretical work [68–70], which focuses on the importance of environmentally friendly feature of products or services for customers. The perceived seasonality feature of agricultural products was evaluated using four items. Rural e-commerce entrepreneurial farmers were asked about the extent to which they believe that their agricultural products are strongly seasonal in price, cost, production, and supply. The perceived locality feature of agricultural products was assessed using three items. Respondents were asked about the extent to which they believe their agricultural products are locality-based ones. Previous studies have not used a multiple measurement approach to capture the seasonality and locality. Therefore, two subscales were designed to measure the two attributes of agricultural products. In line with the accepted definitions of seasonality and locality, we developed these two measures using prior theoretical work on seasonality [71–74] and locality [75–77]. Before including the scale of agricultural product attributed in the present study, the scale and respective items were administered to an independent sample of rural entrepreneurial farmers who are utilizing livestreaming to promote their agricultural products. The exploratory and confirmatory factor analyses

on data from the 190 questionnaires collected supported the agricultural product scale's three-factor structure. All items were loaded significantly ($p < 0.001$) on their expected factors, and the model's overall fit was satisfactory ($\chi^2 = 74.96$, df = 41, CFI = 0.988, TLI = 0.984, NFI = 0.973, RMSEA = 0.06).

Following Xue, Liang, Xie, and Wang [17], we measured responsiveness with four items. These items assess the degree to which a livestreaming platform meets rural e-commerce entrepreneurial farmers in anticipating and responding promptly and effectively to consumers [48]. On the basis of the works of Xue, Liang, Xie, and Wang [17] and Zhao, Wang, and Zhou [78], we captured the degree of interactivity using five items. These items assess the extent to which the rural e-commerce entrepreneurial farmers can provide consumers with help, advice, or information through a livestreaming platform. Entertainment refers to the extent to which the rural e-commerce entrepreneurial farmers can make consumers feel fun or pleasure through a livestreaming using the platform. Following prior work, we developed five times to capture the degree of perceived entertainment [17,79,80]. TTF captures the extent to which a livestreaming platform can match the rural e-commerce entrepreneurial farmers' needs and assist them in reaching consumers and endorsing their agricultural products through livestreaming [22]. To measure TTF, we adopted nine items from Howard and Rose [81] and Lam, Cho, and Qu [82]. We asked respondents to indicate the extent to which they can use livestreaming services in the platform to successfully reach consumers and market their agricultural products. To measure the differences in the engagement in CSR, we adopted 10 items from Luo [83] and Isabelle [84] and modified them specifically for this study. We asked the respondents to indicate the extent to which the firm is committed to engaging in CSR activities. To measure rural e-commerce entrepreneurial farmers' intention to adopt livestreaming in the platform, we used eight items developed by prior research and modified them to achieve the research objective [79,85,86]. These items capture rural e-commerce entrepreneurial farmers' continuous behavioral intention to use livestreaming, specifically gauging the extent to which they would like to take livestreaming in the platform in the future. To measure firm performance, we used five self-reported performance indicators that were adopted and modified from prior studies [87–90]. We asked rural e-commerce entrepreneurial farmers to assess their profitability, net profit margin, profitability growth, sales performance, and overall firm performance compared with those of their industry rivals.

4. Analyses and Results

To test our hypotheses empirically, we used partial least squares (PLS) structural equation modeling (SEM) [91]. SEM is a popular statistical approach that can be used to estimate a series of separate multiple regression equations simultaneously by integrating the logic of confirmative factor analysis and multiple regression. Due to the use of SEM as a unique and powerful utility to establish measurement and structural models simultaneously, we believe a SEM approach obviously offers vast potential to analyze key links in the study. Before empirically testing the hypotheses, we first assessed the reliability and validity of the constructs by checking the measurement model.

4.1. Measurement Reliability and Validity

Table 1 presents the results of the measurement assessment, which summarizes the means, standard deviations, factor loadings, construct reliabilities, and the average variances extracted (AVEs). Given that all the established scales were used to measure the variables in this study, all measures exhibit strong reliability and validity. As shown in Table 1, all the Cronbach's alpha values, ranging from 0.845 to 0.957, and composite reliabilities, ranging from 0.907 to 0.963, are greater than 0.80, exceeding the 0.70 benchmark [92,93]. Therefore, our constructs exhibit strong internal reliability. In addition, outer loadings of all constructs are statistically significant with values greater than 0.80, indicating that the measurement model is strongly reliable [94,95]. We also calculated the AVE values for the constructs, and the results showed that all values are above the 0.50 cutoff, ranging

from 0.716 to 0.806. These results suggest that the measures exhibited adequate convergent validity and reliability [92]. Following the convergent validity analysis, we assessed the discriminant validity by comparing the square root of AVE of each construct and correlation between the construct and other constructs in the model. As shown in Table 2, the results verified that the square root of AVE of each construct is higher than the correlation between the construct and others, providing an adequate discriminant validity of the measures [92]. To verify the discriminant validity of the measures, we also compared the loading values of each single indicator with the crossloadings with other indicators. The results show that each indicator loading is higher than the respective crossloadings, again suggesting adequate discriminant validity of the measures. Moreover, we checked the heterotrait–monotrait ratio (HTMT) of the correlations [96], and the results indicated that all HTMT correlations values are not greater than 0.85, suggesting satisfactory discriminant validity for all constructs in the model. Lastly, following prior work [97,98], we used Stone–Geisser's Q^2 to assess the predictive validity of the latent constructs in the model. The results showed that the crossvalidated communality and redundancy values are higher than zero, ranging from 0.282 to 0.497, demonstrating adequate predictive validity in the model [94,99]. Overall, the constructs and their respective indicators exhibit strong reliability and validity in the context of this study.

Table 1. Descriptive statistics and validity assessments of the constructs.

Construct and Indicators	Mean	STD	Item Loading	Cronbach's Alpha	CR	AVE
Perceived locality (LOC)				0.845	0.907	0.764
LOC1	5.223	1.250	0.834			
LOC2	5.267	1.250	0.884			
LOC3	5.326	1.281	0.904			
Perceived seasonality (SEA)				0.904	0.933	0.776
SEA1	5.321	1.286	0.866			
SEA2	5.347	1.304	0.874			
SEA3	5.300	1.284	0.901			
SEA4	5.282	1.348	0.883			
Perceived eco-friendliness (ECF)				0.920	0.943	0.806
ECF1	5.376	1.354	0.901			
ECF2	5.340	1.314	0.896			
ECF3	5.303	1.398	0.898			
ECF4	5.305	1.333	0.896			
Responsiveness (REV)				0.907	0.935	0.782
REV1	5.211	1.271	0.873			
REV2	5.213	1.223	0.883			
REV3	5.129	1.240	0.896			
REV4	5.275	1.280	0.885			
Interactivity (INT)				0.923	0.942	0.764
INT1	5.084	1.418	0.871			
INT2	5.148	1.287	0.872			
INT3	5.174	1.292	0.872			
INT4	5.286	1.264	0.880			
INT5	5.235	1.276	0.874			
Entertainment (ENT)				0.917	0.938	0.750
ENT1	5.152	1.256	0.899			
ENT2	5.131	1.287	0.880			
ENT3	5.005	1.295	0.868			
ENT4	5.172	1.326	0.868			
ENT5	5.000	1.254	0.814			

Table 1. *Cont.*

Construct and Indicators	Mean	STD	Item Loading	Cronbach's Alpha	CR	AVE
Task–technology fit (TTF)				0.954	0.961	0.730
TTF1	5.265	1.300	0.852			
TTF2	5.230	1.294	0.843			
TTF3	5.172	1.271	0.869			
TTF4	5.172	1.286	0.852			
TTF5	5.282	1.255	0.852			
TTF6	5.157	1.312	0.865			
TTF7	5.193	1.243	0.845			
TTF8	5.186	1.286	0.859			
TTF9	5.268	1.292	0.854			
Corporate social responsibility (CSR)				0.957	0.963	0.722
CSR1	5.305	1.321	0.850			
CSR2	5.416	1.300	0.852			
CSR3	5.394	1.299	0.846			
CSR4	5.240	1.276	0.853			
CSR5	5.343	1.317	0.844			
CSR6	5.293	1.286	0.855			
CSR7	5.303	1.287	0.849			
CSR8	5.368	1.298	0.851			
CSR9	5.366	1.327	0.848			
CSR10	5.420	1.363	0.852			
Intention to adopt (ITA)				0.943	0.953	0.716
ITA1	5.009	1.781	0.818			
ITA2	5.131	1.606	0.838			
ITA3	4.716	1.606	0.864			
ITA4	4.247	1.870	0.847			
ITA5	4.301	1.570	0.853			
ITA6	4.429	1.580	0.841			
ITA7	4.699	1.583	0.849			
ITA8	4.770	1.595	0.859			
Firm performance (PER)				0.922	0.941	0.762
PER1	5.401	1.428	0.884			
PER2	5.375	1.392	0.890			
PER3	5.125	1.402	0.860			
PER4	5.122	1.404	0.878			
PER5	5.136	1.331	0.852			

Note: AVE = average variance extracted, CR = composite reliability, and STD = standard deviation. Due to space limitations, detailed measurement items are omitted, but they are available from the corresponding author upon request.

Table 2. Correlations and discriminant validity among the constructs.

Variables	1	2	3	4	5	6	7	8	9	10
1. Perceived eco-friendliness	***0.898***									
2. Perceived seasonality	0.582	***0.881***								
3. Perceived locality	0.567	0.558	***0.874***							
4. Responsiveness	0.522	0.514	0.483	***0.884***						
5. Interactivity	0.480	0.399	0.434	0.669	***0.874***					
6. Entertainment	0.562	0.547	0.478	0.671	0.676	***0.866***				
7. Task–technology fit	0.623	0.568	0.584	0.713	0.696	0.739	***0.855***			
8. Corporate social responsibility	0.651	0.610	0.630	0.705	0.695	0.700	0.790	***0.850***		
9. Intention to adopt	0.420	0.408	0.381	0.532	0.600	0.618	0.616	0.599	***0.846***	
10. Firm performance	0.583	0.505	0.519	0.656	0.685	0.687	0.714	0.730	0.665	***0.873***

Note: Values in italicized bold denote the square root of the AVE of each construct.

4.2. Hypothesis Testing

Following the measurement model estimation, we empirically tested the theoretical model and the hypotheses. Figure 2 presents the results of the structural equation modeling analysis. Following Chin's (1998) approach [94], we estimated the coefficient of determination R^2 and the path coefficient with their respective t-values. The R^2 values for the three endogenous variables (e.g., task–technology fit, intention to adopt livestreaming services, and firm performance) indicate satisfactory explanatory power for our model (0.422–0.708). Overall, the results presented in Figure 2 indicate that the constructs are largely related in the theoretically predicted manner. Specifically, the results show a significant positive relationship between the two features of agricultural products, that is, perceived locality (b = 0.144, t = 3.475, $p < 0.01$), perceived eco-friendliness (b = 0.137, t = 2.640, $p < 0.01$), and TTF for rural e-commerce entrepreneurial farmers who are using livestreaming to reach consumers and to sell their agricultural products, such as fruits and vegetables, in China. We also find corroborating evidence of a positive and significant relationship between three features of livestreaming services, that is, interactivity (b = 0.220, t = 4.327, $p < 0.001$), responsiveness (b = 0.213, t = 4.484, $p < 0.001$), entertainment (b = 0.266, t = 4.632, $p < 0.001$), and task–technology fit for rural e-commerce entrepreneurial farmers who are using livestreaming. Therefore, these results indicate that the perceived locality and eco-friendliness features of agricultural products, and the features of livestreaming services (i.e., interactivity, responsiveness, and entertainment), as hypothesized, are key determinants of the technology appropriateness for rural e-commerce entrepreneurial farmers to reach consumers and market their agricultural products through livestreaming. These results support Hypotheses 1, 3, 4, 5, and 6. However, the perceived seasonality of agricultural products does not have a significant effect on the task–technology fit (b = 0.065, t = 1.652); hence, Hypothesis 2 is rejected.

Furthermore, we examined the contribution of the technology appropriateness for online livestreaming to rural entrepreneurial farmers' intention to adopt livestreaming as an approach to reach consumers and market their agricultural products as well as the perceived benefits and usefulness of achieving the TTF in improving their performance. As shown in Figure 2, the path coefficients from TTF to both rural entrepreneurial farmers' intention to adopt livestreaming (b = 0.616, t = 16.895, $p < 0.001$) and their performance improvement (b = 0.714, t = 21.811, $p < 0.001$) are highly significant and in the predicted positive direction. Therefore, Hypotheses 7 and 8 are supported. These results imply that achieving a successful TTF can motivate rural entrepreneurial farmers to adopt livestreaming and help them achieve better performance by using a livestreaming service.

Finally, we tested Hypothesis 9 by examining the possible role of engagement in CSR in moderating the relationship between the TTF and rural entrepreneurial farmers' intention to adopt livestreaming. As shown in Figure 2, the path coefficient of the interaction term between the TTF and engagement in CSR is positive and statistically significant (b = 0.045, t = 2.985, $p < 0.01$). This result indicates that engagement in CSR plays an important role in positively moderating the effect of TTF on rural entrepreneurial farmers' intention to adopt their livestreaming services. More importantly, when the moderator (i.e., CSR engagement) is concluded in the model, the R^2 of rural farmers' intention to adopt livestreaming services is further increased from 0.379 to 0.422. On the basis of these results, Hypothesis 9 is supported. These findings suggest that engagement in CSR greatly helps enhance rural entrepreneurial farmers' intention to adopt livestreaming services by achieving technology appropriateness for marketing their agricultural products in the platforms. In the following section, we discuss these results and their implications.

To check the robustness of the SEM results, we performed regression analyses and SEM analyses by using Amos approach to verify the hypothetical relationships of the study. The results of the regression analyses and the SEM analyses using Amos are effectively equivalent to our results achieved from the use of the PLS SEM estimation, providing strong support for our main results. Owing to space limitations, we report only the results

of the PLS SEM estimation here. The results of the robustness check of our regression and Amos-based SEM are available upon request.

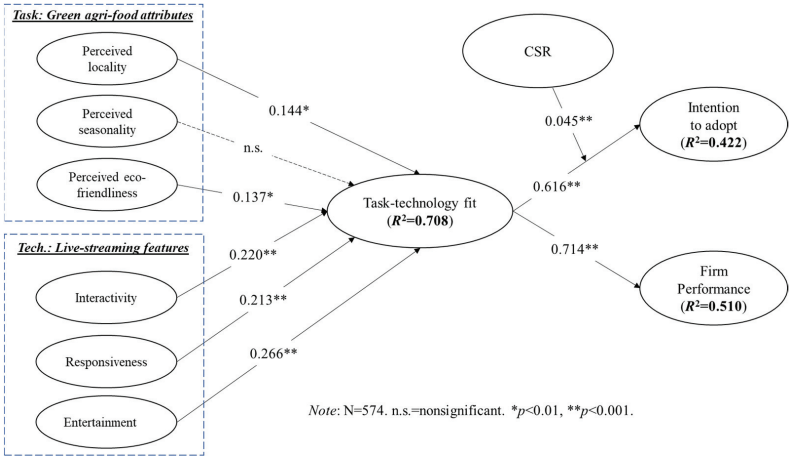

Figure 2. Estimated results of the hypothesis tests using a structural equation modeling.

5. Discussion and Conclusions

The main purpose of this study is to examine whether livestreaming e-commerce technology can help green agri-food firms achieve production and marketing connection. Our results reveal that a good fit exists between livestreaming e-commerce and green agri-food marketing. The introduction of livestreaming into green agri-food marketing can effectively demonstrate the locality and eco-friendliness of green agri-food and bring obvious performance to green agri-food enterprises.

The findings are consistent with the fact that livestreaming can improve marketing performance [13,41,44]. When agricultural product marketing is eco-friendly and local, the responsiveness, interactivity, and the entertainment of livestreaming e-commerce technology fit the marketing well. This helps agricultural firms and consumers achieve information symmetry. The responsiveness and interactivity of livestreaming would make the eco-friendliness information and local information of agricultural products be transmitted in time between the supply and demand sides, which promotes the effective flow of agricultural product information between sellers and buyers and solves the problem of asymmetry of product information.

Furthermore, the responsiveness and interactivity of livestreaming are conducive to two-way real-time communication between buyers and sellers. Green agri-food enterprises can make timely adjustments and feedback according to consumer needs and let users buy safe and satisfactory green agri-food. The real-time online interaction of livestreaming of green agri-food enriches product information allows users to understand the agricultural products they purchase in a comprehensive and true manner and improves the users' trustworthiness in agricultural products [100]. The real-time communication and interactive marketing provided by livestreaming e-commerce has broken the limitation of traditional agricultural product marketing that mainly conveys product information through pictures and text, making agricultural product marketing more fun [41]. The livestreaming technology is not only helpful to the marketing of green agri-food but also has a positive effect on firm performance and e-commerce adoption willingness. When agricultural product firms perceive the fit of agricultural product sales and live e-commerce technology, agricultural product firms are more willing to adopt livestreaming e-commerce. Thus, agricultural product sales performance is also improved.

Unfortunately, the seasonality of green agri-food has no significant effect on the fit of livestreaming of green agri-food. The seasonal problem requires the participation of multiple parties, which must be resolved by accelerating the construction of the supply chain system, goods collection warehousing, and cold chain transportation. It is a problem that cannot be solved by a single technology independently [101,102]. Although green agri-food firms recognized that livestreaming provides effective production and marketing connection, truly helps green agri-food firms, and effectively displays the characteristics of agricultural products, users can intuitively feel the locality and eco-friendliness of green agri-food. However, the seasonality is still a knotty problem. Green agri-food firms believe that livestreaming technology cannot solve the marketing problems caused by seasonality.

Findings also show that the green agri-food enterprises' perception of CSR toward livestreaming enterprises has a moderating effect on the relationship between the fit of livestreaming of green agri-food and livestreaming e-commerce adopt intention. That is, in the presence of high CSR, the stronger the green agri-food livestreaming fit, the more the intention to adopt livestreaming is. By contrast, in the presence of low CSR, the weaker the green agri-food livestreaming fit, the lower the intention to adopt livestreaming. The result is consistent with previous studies on consumer CSR attribution [60,61]. When green agri-food enterprises perceive that e-commerce companies have a high sense of CSR, they realize more that the livestreaming platforms provided by e-commerce companies are compatible, and they more actively adopt livestreaming platforms to repay e-commerce companies. This reflects that the fulfillment of CSR triggers a virtuous circle.

For theoretical implications, this study fills the relatively blank field of enterprise user behavior research. Our study explores the fit between livestreaming e-commerce and green agri-food marketing and reveals the applicability of livestreaming technology in the field of agricultural product marketing. This study verifies that livestreaming is helpful to the production and marketing connection. It proves that livestreaming technology can help green agri-food enterprises complete marketing tasks and confirms that green agri-food livestreaming fit has a positive role in the willingness of livestreaming adoption and performance. It provides a theoretical basis for the application of livestreaming technology in the agricultural field. Furthermore, this study adds CSR variables on the basis of the original TTF theoretical framework. In addition, research confirms the regulatory role of CSR in the development of livestreaming e-commerce, which not only verifies the results of TTF theory but also expands and broadens the scope of application of TTF theory, providing new ideas and bases for the subsequent research of the adoption of live e-commerce.

For managerial implications, the findings regarding the fit between livestreaming e-commerce and green agri-food indicate that livestreaming technology can be a good marketing channel and tool when green agricultural products have regional and eco-friendly characteristics. Therefore, green agricultural products can expand the sales channels and connect with end users by actively adopting live e-commerce services.

This study also suggests that when agricultural products are at risk of slow sales, green agri-food firms should rely on livestreaming technology to improve their production and marketing abilities within and outside their regions. E-commerce companies should also activate green channels for farmers and expand the marketing channel for unsellable agricultural products. At the same time, e-commerce should increase targeted assistance to green agri-food enterprises such as the provision of targeted training courses and services and provide preferable logistics services at lower costs in regions where sales of agricultural products are restricted.

Moreover, in order to pursue sustainable development, e-commerce companies should have corresponding ways to fulfill their CSR, such as supporting the development of weak industries, increasing the income of farmers, and exerting an effort in environmental protection. E-commerce companies should use their own advantages to carry out their corporate environmental responsibilities and social responsibilities, support weak industries, and enhance the development of agriculture on the supply side, which can not only establish a good corporate image but also have a positive effect on the long-term development

of e-commerce companies. When e-commerce companies conduct their CSR activities, donations, charity, and participation in public welfare are not enough. Business users expect that e-commerce companies can use their own technological resources to support weak industries, thus effectively solving social problems. Therefore, e-commerce companies should integrate CSR into the core business and business strategy, use their own advantages to coordinate the economic benefits and social responsibilities, and accelerate the healthy and sustainable development of e-commerce companies.

6. Limitations and Future Study

First, in terms of limitations, this study uses a questionnaire survey method to collect data. Affected by factors such as manpower, time, and economy, the respondents are individual green agri-food firms in China. The findings are not universal. On the other hand, the products are only green agri-food. In future studies, we will expand the scope of product application and the collection of overseas data to explore whether the model will have cross-regional and cross-cultural influences.

Second, the study mainly focuses on the inherent characteristics of green agri-food and the technical characteristics of livestreaming technology, while ignoring the organizational characteristics of agricultural enterprises, such as the organizational scale, organizational technological innovation, organizational culture, and other variables. In future studies, we will add organizational characteristic variables related to technology adoption to improve this study model.

Third, numerous short video platforms have also provided livestreaming e-commerce services, and each livestreaming e-commerce platform may have different technical characteristics. In this study model, this type of livestreaming e-commerce platform is not subdivided, wherein only the general characteristics of livestreaming e-commerce are considered. In future studies, we will subdivide the types of livestreaming e-commerce platforms and deepen the study of this model.

Fourth, while we focus on examining the effect of task–technology fit which is predicted by various green agri-food attributes and livestreaming features, future research might fruitfully examine how consumer reactions, such as consumer awareness and service satisfaction, and other mechanisms would shape entrepreneurial firms' intention or decision to adopt e-commerce and their firm performance.

Finally, this study focuses on the positive aspects of livestreaming e-commerce, and it does not mention the challenges such as the low conversion rate and insufficient exposure of sellers. In future studies, we will discuss the negative issues of livestreaming e-commerce and deepen the study on the livestreaming of green agri-food.

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Abbreviations

TTF Task–technology fit
CSR Corporate social responsibility

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Strategic Orientation, Digital Capabilities, and New Product Development in Emerging Market Firms: The Moderating Role of Corporate Social Responsibility

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Abstract: Strategic orientation represents an important antecedent condition for new product development (NPD) performance, which can help firms create competitive advantage and promote sustainable growth. This study aims to explore the role of strategic orientation (i.e., technology orientation, customer orientation) in promoting firms' digital capabilities and NPD performance in the context of digital transformation. Using a resource-based view and its extended dynamic capabilities as a theoretical foundation, we provide a comprehensive framework by developing a set of hypotheses. In addition, we examine the moderating effect of corporate social responsibility (CSR) on the relationship between strategic orientation and NPD performance. Using data from a sample of 174 Chinese manufacturing firms, we perform structural equation modelling to empirically test our arguments. Our findings show that technology orientation and customer orientation play a critical role in driving firms' digital capabilities. Moreover, we find that the two dimensions of strategic orientation tend to exert different effects on NPD performance, with technology orientation playing a more significant role than customer orientation in contributing to NPD performance. Finally, our findings strongly suggest that a firm's CSR engagement moderates the relationship between its customer orientation and NPD performance, such that the higher the firm's engagement in CSR, the greater the contribution of customer orientation to the firm's NPD performance. Our findings provide new insights into non-market mechanisms such as CSR through which firms can compensate for their strategically oriented practices in the NPD process.

Keywords: strategic orientation; digital capabilities; corporate social responsibility; new product development performance; China

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1. Introduction

Corporate strategic orientation is a hot topic that has attracted the attention of scholars from fields such as marketing, innovation, and information. Strategic orientation reflects a firm's decisions, direction, and beliefs to create competitive advantage and promote sustainable development, and the way it is positioned affects firm performance [1–3]. Strategic orientation contributes to product innovation, for technological orientation and customer orientation are key strategic elements for the successful development of new products [4]. Technology-oriented firms focus on technology investment and emphasize the introduction or use of new technologies to create value [1], whereas customer-oriented firms tend to build strong ties with their target customers, and their value creation is mainly derived from customer demand [5]. Recently, the digital environment has been creating a new business model influenced by the rapid development of smart technologies and big

data [6,7]. First, companies are using these cutting-edge technologies to fundamentally change business processes and facilitate company capabilities and product innovation [8,9]. Second, companies are able to identify and understand customer needs by building direct and deep interactions with them [10]. Therefore, in the new business model, do companies have to weigh technology orientation against customer orientation, and are they equally important? We know little about this dynamic; hence, the issue of strategic positioning of emerging economies in the context of digital transformation is of great interest.

Firstly, rapidly evolving technologies have led to an increasingly competitive industrial environment where new product development (NPD) has become key to sustainable business growth [11]. Assessing the performance of NPD helps firms measure market performance, improve scientific management, and promote sustainable development [12]. Many scholars have only explored the direct impact of strategic orientation and firm performance, with few explanations of how strategic orientation affects firms' NPD performance [13]. Moreover, discussions of the two in the digital environment are mostly in the form of case studies and have not been fully investigated [14–16].

Secondly, researchers have found that resources and new capabilities are necessary for firms to compete effectively in the digital age [17,18]. Specifically, digital change in manufacturing has transformed traditional production management and offers great potential for innovation in customer service and product production development [19]. The higher the digital capability of a firm, the better their business performance [20–22]. Therefore, on the basis of previous studies [1,2,23,24], we use the resource-based view (RBV) and its extended dynamic capabilities as a theoretical basis to explain how strategic orientation affects new product performance. We further explore the mediating role of a firm's digital capabilities in shaping the relationship between strategic orientation and NPD performance and investigate how strategic orientation (technology orientation and customer orientation) generates competitive advantage through digital capabilities, thereby improving NPD performance.

Furthermore, creating a better and sustainable future for businesses requires serving all stakeholders in a harmonious manner. Corporate social responsibility (CSR) is a valuable source for businesses to seek new opportunities, to enhance employee responsibility, to identify customer needs, and to enhance social acceptance through product responsibility, philanthropy, and environmental awareness [25]. Therefore, in addition to establishing an appropriate strategic orientation, companies should strive to engage in CSR and increase innovative revenue through newer and better products [26].

Therefore, the objective of this study is to extend this stream of research by specifically examining the impact of customer orientation and technology orientation on firms' NPD performance. In addition, we aim to investigate how firms' engagement in CSR may moderate the relationships between different strategic orientations on NPD performance. We empirically test our conceptual framework by using survey data from 174 Chinese manufacturing firms. The reason for our focus on manufacturing firms is that the manufacturing industry has long been growing in a relatively stable environment. Moreover, rapidly evolving technology brings unprecedented opportunities and challenges to the manufacturing industry, and more importantly, the ability of firms to exploit technology during periods of environmental turbulence is key to achieving competitive advantage [27]. Manufacturing firms need to improve their dynamic capabilities to adapt to the environment to make rational integration and configuration to cope with possible future changes [28]. China, with its rapid economic and technological development, certainly provides a rich context for this research.

The research contributions of this paper are threefold. First, on the basis of dynamic capabilities and stakeholder-related literature, this paper builds on previous research to explore the relationship between strategic orientation and NPD performance in a digital environment. Second, we assess how strategic orientation affects NPD performance through digital capabilities from an information systems perspective. Our observations reinforce that those digital capabilities supported by the RBV are the primary capabilities of firms in

a technological environment [17]. Third, we investigate the impact of different levels of CSR on the relationship between strategic orientation and NPD performance.

The study is structured as follows: In the next section we present an overview of our theoretical model and develop our hypotheses. In the third section, we outline the research methods. The fourth section reports the analyses and results. In the final section, we discuss the results, outline their theoretical and practical implications, and provide several possible avenues for future research.

2. Theoretical Background and Hypothesis Development

2.1. Theoretical Foundations

The RBV has long been regarded as one of the most important conceptual frameworks in academia. It states that the competitive advantage and superior performance gained by firms are derived from organizations' unique and not easily imitated resources and capabilities [29,30], thus explaining the differences in performance between organizations. In the digital age, resources and new capabilities are equally necessary to achieve sustainable competitive advantage [17,18]. Strategic orientation is seen as a corporate culture that reflects a firm's philosophy of action to gain competitive advantage, a belief in promoting sustainable development, and a direction for decision making, and the way it is positioned affects corporate performance [1,2,13]. Technology-oriented firms focus on technological investments and emphasize the introduction or use of new technologies to create value [1]. Specifically, the technological capabilities of firms facilitate the pursuit of higher performance [31]. Customer orientation is the most decisive element of market-oriented strategy; it emphasizes customer interests first and aims to maximize customer value [5]. This study examines the impact of technology orientation and customer orientation on NPD performance from a strategic marketing perspective [32].

As an extension of RBV, dynamic capabilities are seen as higher-order capabilities in the process of organizational renewal [33]. In the digital age, companies need strong perception, integration, and configuration capabilities to remain competitive. In particular, digital capabilities have become a key influencing factor for companies to manage resources and cope with turbulent environments [9]. We have focused on this in our research by introducing the new term "digital capability" [34]. It denotes a firm's digital capabilities in terms of a flexible IT infrastructure and well-developed information management capabilities to cope with rapidly evolving technologies and uncertainties [35].

With health crises, economic crises, social crises, environmental crises, and growing geopolitical tensions on the horizon, companies need to create a better and sustainable future that serves all stakeholders in a harmonious way. We are, so to speak, entering an era of stakeholders. The NPD process requires consideration of many factors, such as customer needs, advanced technology, competitor status, and environment, which cannot be circumvented by different stakeholders. Hence, new products that meet specific needs help achieve the goals of stakeholders [36]. According to stakeholder theory, firms that ignore different stakeholders are vulnerable to social and economic disruptions [37]. Therefore, CSR influences firms to produce valuable assets and achieve competitive advantage, which help justify strategic choices.

2.2. Strategic Orientation and NPD Performance

Strategic orientation is seen as a corporate culture that reflects a firm's philosophy of action to gain competitive advantage, where firms interact with the market through established beliefs to create quality corporate value [1,24]. On the basis of RBV [29], we explore the impact of technology orientation and customer orientation on firms' NPD performance in the context of digital transformation from a strategic marketing perspective [32].

Previous research has shown that market orientation has a positive and significant impact on firm performance, and market-oriented firms contribute to successful NPD [38]. Scholars considered customer orientation the most decisive factor in market-oriented strategies, and it is considered a set of beliefs that give the highest priority to customer

interests [39]. In turn, research on NPD has highlighted the role of customer orientation [40]. Although some scholars argue that this orientation is limited by the current level of customers to only incremental improvements unable to create radical innovation [41]. Still, many scholars see a positive relationship between customer orientation and innovation success [42].

Alongside customer orientation, technology-oriented firms prioritize investment in technology in the context of acquiring substantial technology, using it for NPD, and subsequently creating corporate value [1,43]. Technology orientation prioritizes technological factors, in contrast to customer-oriented attitudes that highlight customer value [44]. Firms that emphasize the application of technology to the development of new products and services that meet customer needs become more innovative by actively acquiring advanced new technologies [12]. By leveraging new technologies, technology-oriented firms efficiently connect to the market, integrating potential customer value and developing creation in the product development process [45]. In the face of rapidly changing technological developments and an increasingly competitive industrial environment, the use of digital technologies enables us to grasp market needs efficiently and precisely. In such an environment, technology orientation should have a positive impact on firms' NPD performance in the context of their digital transformation, because firms' technological capabilities facilitate the pursuit of higher performance [31]. Previous studies have documented this positive relationship, particularly for Chinese firms [4,24]. According to the RBV and the above, both technology orientation and customer orientation have distinct cultural influences on firm behavior. Therefore, we propose the following relationships:

Hypothesis 1a (H1a). *Greater technology orientation leads to higher NPD performance.*

Hypothesis 1b (H1b). *Greater customer orientation leads to higher NPD performance.*

2.3. The Mediating Role of Enterprises' Digital Capabilities

Scholars have argued that the direct impact of strategic orientation and performance is positive, whereas others have dismissed the positive relationship; thus, the process between the two deserves further exploration [24]. In the context of a turbulent digital environment, it is of great interest to understand how and to what extent firms understand how and what capabilities are required for strategic orientation to influence NPD performance [46]. In the new business environment where digital technology is developing rapidly, we encourage emerging economies to take a dynamic capabilities perspective on the mechanisms of intermediation [47]. Through these capabilities, companies sense and integrate resources and further reconfigure them to achieve a sustainable competitive advantage for the business in a volatile environment [9]. Dynamic capabilities plausibly explain why firms maintain a competitive advantage in times of environmental turbulence [48]. In particular, small and medium-sized enterprises (SMEs) may perform better if their resource allocation is bold and innovative, as technological capabilities raise firms' expectations of achieving higher performance [49].

Scholars are increasingly focusing on the flexibility needed for organizations to adopt technology and digitalization to cope with turbulent environments and thereby gain a competitive advantage [50]. Prior research based on RBV has found digital capabilities to be a key competency for firms in a technological environment [17]. We identified that a flexible IT infrastructure and well-developed information management capabilities define a firm's digital capabilities, which address the firm's response to rapidly evolving technologies and various uncertainties [35]. Taking industrial robots in the production process of manufacturing firms as an example, automated production lines not only provide accurate operations but also increase efficiency, reducing costs. The findings also suggest that digital capabilities can better facilitate businesses to create more value for their customers, which is an important finding for companies to build a competitive advantage [51]. This finding is supported by another study showing that the provision of competitive products from product producers is associated with the adoption of digital technologies [52]. In the food

industry and in pharmaceutical development, digital technology has even facilitated the development of new products, making it easier for companies to enter the market through big data and analytics. This ability facilitates the successful development of new products through accurate market forecasting, thus enhancing the ability of companies to launch new products and services [53] and to use them to a greater extent through better-quality digital capabilities. The increasingly digital business environment also requires the development of novel digital competencies [54]. Therefore, on the basis of the dynamic capabilities of an extended view of the enterprise resource base, we propose the following relationship:

Hypothesis 2 (H2). *A firm's digital capabilities mediate the relationship between strategic orientation and the firm's NPD performance.*

2.4. CSR and NPD Performance

Strategic orientation refers to the beliefs and directions of action that guide a firm to gain superior performance, and the beliefs established and values developed by the firm to interact with the market to create long-term competitive advantage [1,2]. On the basis of stakeholder theory, firms that ignore stakeholders are vulnerable to social and economic disruptions [37], as robust and sustainable growth is associated with many stakeholders through whom firms can access unexpected information resources and opportunities that can enhance competitive advantage [36]. This external sharing and communication become key predictors of corporate innovation [55], which can, in turn, be a beneficial business strategy if start-ups integrate CSR into product development [56].

CSR has been defined by several pioneering studies as a policy, activity, or action of a company that goes beyond multiple stakeholders inside and outside the company and beyond existing economic and legal obligations [57]. The integration of social factors in new product design is an innovative way for companies to achieve sustainable business [58]. In turn, new products that meet specific needs help achieve the goals of some stakeholders [36], as NPD takes into account many factors, such as customer needs, advanced technology, the state of competitors, and environmental issues. These factors cannot be circumvented by different stakeholders. We believe that corporate environmental responsibility promotes the development of innovative cleaner production technologies, and that this mutually beneficial behavior not only enhances innovation but also helps companies develop their strategic capabilities [59]. Academics analyzed data from Chinese manufacturing firms and found that the needs of specific stakeholders led these firms to engage in more active CSR activities, which, in turn, led to green innovation [60]. Neglecting CSR issues can lead to a gradual loss of competitiveness [61,62]. Therefore, CSR issues in NPD cannot be avoided by companies.

The positive impact of CSR has also been confirmed by many recent studies, where companies build a good reputation, which helps them improve their business outcomes [63]. Bereskin and Hsu (2015) found that the integration of social responsibility by pharmaceutical companies into research institutions led to better collaboration in innovation by the latter [64], which, in turn, increased the effectiveness of launching new drugs [65]. Zhang and Lv (2014) argued that CSR encourages employees to participate actively in the company's innovative activities and practices [66], thereby increasing their sense of innovation and their own value. Moreover, strategic CSR has a positive impact on a company's technology and product innovation, regardless of company size [57]. The more a company is committed to CSR, the better it is able to build and maintain relationships with its stakeholders, thus enabling them to benefit from more technological opportunities to innovate in processes and products [67]. Therefore, in addition to establishing a suitable strategic orientation, companies should also strive to undertake CSR, not only because environmental protection reduces operational costs, but to increase innovative revenues through new and better products [26]. When facing many constraints to product innovation in the stage of mass production, companies that ignore CSR issues in the process of NPD can gradually lose their competitive advantage [61]. Thus, firms achieving sustainability

must focus on both NPD activities and CSR issues. Therefore, based on stakeholder theory, we propose the following relationships:

Hypothesis 3a (H3a). *CSR positively moderates the relationship between technology orientation and NPD performance, such that the higher the CSR engagement of a firm, the greater the contribution of technology orientation to the firm's NPD performance.*

Hypothesis 3b (H3b). *CSR positively moderates the relationship between customer orientation and NPD performance, such that the higher the CSR engagement of a firm, the greater the contribution of customer orientation to the firm's NPD performance.*

In summary, on the basis of RBV and its extended dynamic capability theory, we construct a new model to explore the relationship between strategic orientation (technology orientation and customer orientation), digital capability, and CSR and NPD performance. Specifically, this study examines the mediating effect of digital capabilities between strategic orientation and NPD performance, and the moderating mechanism of CSR between strategic orientation and NPD performance. Through this approach, we further explain the relationship between strategic orientation and NPD performance in the context of digital transformation. Our findings aim to provide empirical support and theoretical guidance for strategic orientation research in the digital environment.

3. Methodology

3.1. Sample and Data Collection

Our questionnaire was completed by middle and senior managers of Chinese manufacturing companies for two main reasons. (1) Across the world, manufacturing is the core industry for solid economic development and maintaining national competitiveness. (2) China's manufacturing industry has ushered in opportunities and brought many challenges during the period of digital transformation of enterprises, especially traditional manufacturing enterprises, whose long-standing and stable operating model has made the transformation difficult. Rapidly developing technologies have brought unprecedented challenges to the manufacturing industry, and enterprises need to improve their dynamic capabilities and rationalize and allocate resources to cope with possible future changes [28]. In addition, the ability to leverage technology becomes critical for firms during periods of environmental turbulence [27], and these behaviors are guided by the strategic direction of the firm [68]. To enhance the feasibility and operationalization of the study, our measurement projects are based on previous more established studies, which were carefully reviewed, compared, introduced, and translated into Chinese by translators fluent in both languages.

We surveyed manufacturing companies in a variety of industries including chemical and petrochemical products, machinery and steel manufacturing, electronics and electrical equipment, and medical devices and biopharmaceuticals, to ensure that the findings were varied and generalizable [69]. We were assisted in the distribution of the questionnaire by government departments and industry associations with which we had a relationship. We also interviewed a number of business owners during this period to ensure validity. To be objective and rigorous, we surveyed 30 pilot companies and made minor modifications to improve the clarity of the questionnaire. In the end, we received 190 questionnaires, excluding those with incomplete information and those with obvious patterns of answers, resulting in 174 valid questionnaires, with a valid return rate of 91.5%. Table 1 illustrates the basic characteristics of the sample companies. In general, the sample covered enterprises of different ages, types, sizes, and industrial attributes, indicating that the sample of this study is representative.

Table 1. Demographic characteristics of the sample.

Variables	Frequency	%
Firm age		
Below 10	57	32.8
11–30	97	56.3
Over 30	19	10.9
Ownership structure		
State-owned enterprise	11	6.3
Private enterprise	108	62.1
Foreign-owned enterprise	38	21.8
Joint venture	5	2.9
Others	12	6.9
Firm size		
Below 300	117	67.2
301–2000	40	23.0
Over 2000	17	9.8
Average annual sales		
Below 3 million	12	6.9
3 million–20 million	43	24.7
20 million—400 million	79	45.4
Over 400 million	40	23.0
Product category		
Consumer durables	14	8.0
Consumer non-durables	7	4.0
Complete industrial products	32	18.4
Raw materials/component industrial goods	50	28.7
Others	71	40.8

Note: $n = 174$.

On the basis of procedural controls for possible common method bias (CMB) (e.g., anonymous completion), we further tested for CMB by using a single-factor procedure [70,71]. If a one-factor structure consisting of all conformational frames explains all, then common method variation is present. First, the confirmatory factor analysis model M1 was constructed. Second, the model M2 containing the method factor was constructed. A comparison of the main fit indices of model M1 and model M2 yielded: $\Delta\chi^2/df = 8.47$, $\Delta GFI = 0.372$, $\Delta IFI = 0.376$, $\Delta NFI = 0.362$, and $\Delta RMSEA = 0.143$. The large variation in each fit index indicates that the measurements do not show significant common method bias.

3.2. Variables and Measurements

All items in this study were measured on a 7-point Likert scale ranging from 1, "strongly disagree", to 7, "strongly agree".

Technology orientation and customer orientation. We used the highly developed Technology Orientation Scale [1]. The scale follows the concepts proposed in technology orientation research, including that firms use cutting-edge technology in NPD, that firms readily accept technological innovations based on research findings, and that firms always consider the latest production technologies available. Similarly, using the scale developed by these two scholars to measure market orientation [5], we identified five question items to measure customer orientation.

Digital capabilities. The construction of digital capabilities consists of three dimensions: IT infrastructure capabilities (hardware and software), technological business support capabilities, and creative capabilities using technological resources [34,68]. In particular, the enterprise infrastructure capability is measured by the status of the enterprise's IT hardware and other facilities that support the connection of various digital platforms and the status of the enterprise's system software that supports the integration and expansion of digital platforms. Enterprise technology business support capability is measured by the enterprise's planning, developing, and using information (digital) technology to support

business activities, application solutions, and cooperation mechanisms. Enterprise technology business support capability is measured by information (digital) technology working with partners to develop the company's ability to use technological resources to create new markets, exploit Internet-based business opportunities, and respond to markets.

Corporate social responsibility. Given that CSR research in China started late and no cultural or value differences with Western countries are evident, we used a scale from domestic scholars [72]. The scale's validity in the Chinese context was empirically tested and is in line with the Chinese context. The scale is adopted from the well-established overseas 42-item CSR measure [73], which consists of five dimensions: employee responsibility, product responsibility, integrity and fairness responsibility, philanthropic responsibility, and environmental responsibility.

NPD performance. We measure NPD performance indicators in terms of a firm's satisfaction with its corporate performance over the past three years, including the quantity, speed, and quality of new product launches; contribution of new products in terms of overall corporate profit; and actual sales [30].

Control variables. In line with previous literature on strategy-oriented research [3,69], we included firm age and firm size in our control variables. We measured firm age as the number of years since the firm was established. We measured firm size using the natural logarithm of the number of employees.

4. Results and Analysis

To examine the hypotheses empirically, we adopted a structural equation modeling approach, which is deemed appropriate because our model included multiple mediating relationships. As suggested by Jensen and Szulanski (2004, p. 515) [74], "structural equation modeling is particularly suitable for testing models that are path analytic, especially those including mediating variables, allowing for simultaneous estimation of the relationship between all of the specified variables in the model." We first tested the quality of the model through the reliability and validity of the data to ensure the validity and reliability of the findings, and then used structural equation modelling to examine the hypotheses [75].

4.1. Reliability and Validity

We evaluated reliability using the internal consistency alpha coefficient and combined reliability (CR). Table 2 shows the results of the comparative factor analysis. All structures had Cronbach's alpha values greater than 0.9 (from 0.907 to 0.980), and the combined reliability was greater than 0.80 (from 0.909 to 0.984), which is greater than the baseline value of 0.70, indicating good internal consistency [76]. The factor loadings (FL) for all constructs exceeded 0.6 and were all statistically significant, indicating that the measurement models were reliable. In addition, our initial measurement instruments were based on well-established scales, which ensured good construct validity. The average variance (AVE) for each construct took values ranging from 0.676 to 0.886, which are greater than the critical value of 0.50, indicating good convergent validity of our measure [76]. We assessed discriminant validity by comparing the square root of each construct's AVE and the correlation between that construct and the other constructs in the model. As shown in Table 3, the square root of each construct's AVE was higher than the correlation between that construct and the other constructs, indicating good discriminant validity [76]. Furthermore, the loading values for each single indicator were higher than the cross-loading values with the other indicators, providing further evidence of high discriminant validity.

Table 2. Constructs and indicators.

Construct and Indicators	Mean	SD	Factor Loading
Technology orientation (AVE = 0.716, alpha = 0.907, CR = 0.909)			
Cutting-edge technology is used in new product development	5.14	1.274	0.880
Always uses the most advanced technology	5.11	1.267	0.905
Readily accepts technological innovations based on research findings	5.42	1.139	0.821
Considers the latest production technologies available	5.30	1.265	0.772
Customer orientation (AVE = 0.756, alpha = 0.937, CR = 0.939)			
Creates new products with customers in mind	6.08	1.005	0.811
Understands and meets customers' needs	6.22	0.892	0.908
Aims to achieve customer satisfaction	6.23	0.940	0.918
Frequent assessment of customer satisfaction	6.06	0.969	0.889
Focuses on and continuously improves the quality of after-sales service	6.14	0.984	0.817
Digital capabilities (AVE = 0.886, alpha = 0.980, CR = 0.984)			
Status of IT hardware and smart manufacturing facilities	5.09	1.253	0.914
Status of system software and functional components	5.21	1.264	0.897
Technical support for intersectoral business activities	5.09	1.269	0.964
Development of information system applications	5.11	1.261	0.939
Establishes effective cooperation mechanisms	5.13	1.235	0.945
Uses technology to develop new markets with partners	5.03	1.237	0.964
Leverages Internet-based business opportunities	5.17	1.203	0.956
Shares information and responds to the market	5.20	1.205	0.951
New product performance (AVE = 0.830, alpha = 0.971, CR = 0.978)			
Number of new product developments	5.24	1.048	0.876
Speed of new product development	5.18	1.128	0.927
Quality of new products launched	5.42	0.938	0.922
Contribution of new products in the overall corporate profit	5.33	1.071	0.979
Sales of new products	5.14	1.131	0.981
Sales growth rate of new products	5.17	1.155	0.806
Number of new customers gained from new products	5.13	1.148	0.864
Customer satisfaction with new products	5.36	1.075	0.890
Captures the market with new products	5.19	1.135	0.940
Corporate Social Responsibility (AVE = 0.676, alpha = 0.910, CR = 0.912)			
Corporate employee responsibility	5.71	0.953	0.844
Corporate product responsibility	6.05	0.856	0.816
Corporate integrity and fairness responsibility	6.04	0.907	0.905
Corporate philanthropic responsibility	5.57	1.035	0.765
Corporate environmental responsibility	5.83	0.985	0.772

Note: SD = standard deviation, AVE = average variance extracted, CR = composite reliability.

Table 3. Descriptive statistics and correlation analysis results.

Variables	1	2	3	4	5
1. CSR	0.822				
2. NPD	0.405 ***	0.911			
3. Digital capabilities	0.472 ***	0.591 ***	0.941		
4. Customer orientation	0.529 ***	0.300 ***	0.419 ***	0.869	
5. Technology orientation	0.527 ***	0.528 ***	0.550 ***	0.492 ***	0.846

Note: $n = 174$. The diagonal values denote the square root of the AVE of each construct. *** $p < 0.001$.

4.2. Hypothesis Testing

Figure 1 shows the results of our structural equation model ($\chi^2/df = 2.220$, CFI = 0.964, IFI = 0.964, TLI = 0.955, RFI = 0.921, NFI = 0.937, RMR = 0.046, RMSEA = 0.08). The findings indicate that technology orientation has a positive and significant impact on NPD performance (b = 0.423, $p < 0.001$). Technology-oriented companies contribute to successful NPD when conducting business and operations. The results support Hypothesis 1a. However, no statistically significant relationship exists between customer orientation and

NPD performance (b = −0.042, p = 0.599). This finding suggests that in an era of rapid technological development, customers are more receptive to products with technological advantages [13]. However, customers do not have latent needs beyond their current thinking [77], and too much customer bias leads to strategic and market myopia [24], and thus, loss of innovation [77]. Therefore, although both technology orientation and customer orientation have distinct cultural influences on firm behavior, in the context of digital transformation, a firm's technology orientation enhances NPD performance, whereas customer orientation fails to have a direct impact. These findings provide strong support for Hypothesis 1a and suggest rejecting Hypothesis 1b.

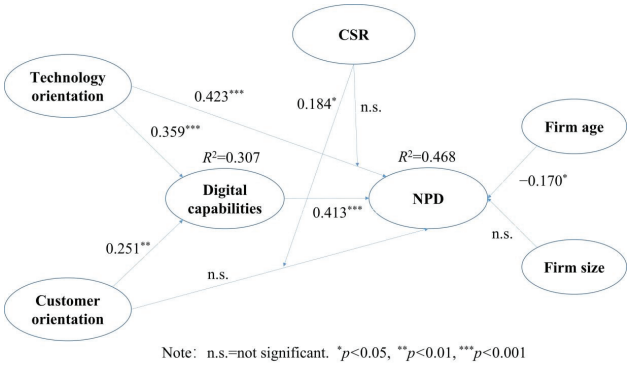

Figure 1. Estimation results of structural equation analysis.

We also examined the contribution of strategic orientation to digital capability. Figure 1 shows the empirical results, which indicate that all coefficients are positive and significant. There was a significant positive relationship between technology orientation and digital capability (b = 0.359, p < 0.001), a significant positive relationship between customer orientation and digital capability (b = 0.251, p < 0.05), and a significant positive correlation between digital capability and NPD performance (b = 0.413, p < 0.001). This result reveals that both technology orientation and customer orientation have a significant positive effect on digital capability, and digital capability has a significant positive effect on NPD performance. The finding suggests that firms with higher digital capability are more conducive to successful NPD. We further verify the mediating effect of digital capability, as shown in Table 4. The results of the study indicate that technology orientation not only predicts NPD performance directly, but also a firm's NPD performance through the mediating effect of digital capability. By comparison, customer orientation, which was previously verified to have no direct significant relationship with NPD performance, predicts NPD performance through the mediating effect of digital capability. The results provide strong support for Hypothesis 2.

Table 4. Form for reporting intermediary variables.

Variables	Point Estimate	Product of Coefficients		Bias-Corrected 95% CI		Percentile 95% CI	
		SE	Z	Lower	Upper	Lower	Upper
Total Effects							
Technology orientation→NPD	0.51	0.107	4.841	0.305	0.726	0.323	0.735
Customer orientation→NPD	0.068	0.103	0.660	−0.145	0.281	−0.138	0.281
Indirect Effects							
Technology orientation→NPD	0.134	0.060	2.233	0.043	0.267	0.045	0.270
Customer orientation→NPD	0.114	0.059	1.932	0.026	0.258	0.028	0.266
Direct Effects							
Technology orientation→NPD	0.384	0.110	3.491	0.186	0.612	0.168	0.597
Customer orientation→NPD	−0.046	0.095	−0.484	−0.218	0.180	−0.243	0.155

Finally, we tested Hypothesis 3a,b by examining the possible role of CSR in moderating the contribution of strategic orientation and NPD performance. As shown in Figure 1, the interaction between technology orientation and NPD is not statistically significant. Therefore, Hypothesis 3a is not supported. However, the path coefficient for the interaction between customer orientation and NPD was positive and statistically significant (b = 0.184, $p < 0.05$). The analysis also showed that the R^2 for NPD performance increased further from 0.449 to 0.468 when the moderating variable (CSR) was concluded. This finding indicates that CSR has a moderating effect on the relationship between customer orientation and NPD performance. For Hypothesis 3a, which was not supported by the analyses in the study, this result leads us to believe that technology orientation is positively associated with technological innovation but has no effect on market innovation [24]. For example, social demands on the environment promote innovation in cleaner production technologies. In other words, this may be a reminder that technology-oriented firms also need to integrate market orientation in order to make more precise strategic decisions with today's rapid development of digital technologies.

5. Discussion and Conclusions

5.1. Discussion

Strategic orientation can represent an important antecedent condition for NPD performance [78]. It is a belief that firms create competitive advantage and promote sustainable development. This study explores the relationship between strategic orientation and new product performance in a digital context. The research is based on RBV and its extended dynamic capability theory, and the role that digital capability resources play in the relationship. First, our findings confirm that technology orientation has a direct positive impact on NPD performance, and Hypothesis 1a is supported. As the new generation of digital technologies today facilitate the rapid development of the digital economy, technology-oriented companies are more conducive to NPD and are important drivers of superior corporate performance. This observation is consistent with previous research findings [79]. Second, the study confirms Hypothesis 2. The results show the mediating role of digital capabilities between strategic orientation and NPD performance, which is also relevant for customer-oriented firms. This finding implies the importance of customer-oriented firms' enhancement of their digital capabilities. Therefore, firms need to focus on building such capabilities to create new corporate value.

In addition, this study further focuses on the contribution of CSR to strategic orientation and NPD performance in the stakeholder era. The results reveal that CSR played a moderating role between customer orientation and NPD performance, thus confirming research hypothesis 3b, which empirically showed that the predictive effect of customer orientation on firms' NPD performance increased significantly with increased CSR. However, hypothesis 3a is not supported. The results show a positive relationship between technology orientation and technological innovation, but not a positive and significant effect on market innovation [24], which also suggests that digitalization has expanded the range of resources available to firms [6]. Moreover, technology-oriented firms are better able to identify data and capabilities generated in the digital environment and organize them to make rational allocations [80].

5.2. Theoretical and Practical Implications

5.2.1. Theoretical Contributions

We propose a new model that links technology orientation and customer orientation, digital capabilities, CSR, and NPD performance. By doing so, we examine the impact of internal digital capabilities and external CSR on the relationship between strategic orientation and NPD performance. The contributions of this study are threefold.

First, we examine the relationship between two important types of strategic orientat ion—technology and customer orientation—and new product performance in the context of digital transformation. Second, assessing how strategic orientation affects NPD

performance through digital capabilities from an information systems perspective is fundamentally an innovation in the study of firm performance. Our use of RBV in combination with digital solutions in information systems is another novel approach of this study, and we argue that this multidisciplinary discussion is necessary [79]. Although researchers have recognized that resources and new capabilities are necessary to achieve sustainable competitive advantage, our observations reinforce that those digital capabilities based on RBV support are the primary capabilities of firms in a technological environment [17]. The higher the digital capability, the better the business performance [35], which is confirmed by our study. This study extends the RBV and its extended dynamic capability theory in the digital context to facilitate an understanding of how corporate capability resources achieve high performance. Third, we investigate the impact of different levels of CSR on the relationship between strategic orientation and NPD performance. In summary, our study builds on the dynamic capabilities and stakeholder literature to provide an in-depth understanding of the boundary conditions of corporate strategy in the digital environment. Furthermore, we build on previous work and further shed light on how the organization of a firm's digital transformation strategy affects performance.

5.2.2. Practical Implications

Research on the factors influencing the effectiveness of mediating between strategic orientation and NPD performance contributes to the development of RBV theory. Moreover, from a practical perspective, this black box model helps business operators understand the maximized strategic value of new technology capabilities in play [81].

First, with the emergence of a new generation of digital technologies such as the Internet of Things, big data, and artificial intelligence, digital resources are beneficial for enterprises to capture new market opportunities, reduce costs, and improve operational efficiency. These benefits are prominent for SMEs with few resources. This study shows that technology orientation promotes the belief that companies embrace digital technology and actively engage in digital transformation, which also further enhances their digital capabilities [8]. The two types of orientation reinforce each other to produce a competitive advantage to achieve superior performance. Currently, digital transformation is still in the developmental stage. As developed and developing countries are in the exploratory stage, technology orientation can help foster digital orientation, accelerate the acceptance of new digital technologies, and assist in successful transformation.

Second, the digital wave has led to a significant change in user information asymmetries. Thus, firms need to have a flexible information (digital) technology infrastructure and well-developed information management capabilities to cope with rapidly evolving technologies and uncertainties. Our findings provide firm managers with a better understanding of how to successfully achieve such capabilities. Our results clearly demonstrate that market orientation and technology orientation represent important factors driving digital capabilities, which can be further transformed into better NPD performance.

Lastly, firm managers should recognize the fact that strategic orientation alone may not be a unique strategic resource, its successful implementation being complementary to non-market resources such as those obtained by engaging in CSR. In particular, we find strong support for the positive moderating effect of CSR engagement in shaping the relationship between customer orientation and NPD performance. This provides important practical implications for customer-oriented firms in the context of digital transformation. That is, customer-oriented firms should strive to undertake CSR in order to achieve better NPD performance, such as by increasing employee service awareness, identifying customer needs, and developing environmentally friendly products. More specifically, this suggests that customer-oriented firms need to consider not only their commitment to their customers but also to their stakeholders by seeking new opportunities through enhanced CSR. In doing so, they should not only effectively identify customer needs but also actively engage in CSR, because successful NPD requires a wealth of resources from inside and outside of the organization [82,83].

5.3. Limitations and Avenues for Future Research

Future research is encouraged to deal with some limitations of this study. First, we empirically examined the conceptual model by Chinese manufacturing firms; hence, a clear limitation of this study is its generalizability to firms from developed or other emerging economies. We hope future research can extend the generalizability of our findings to different market contexts. Second, we explored the effects of different strategic orientations in the short term, and future research may utilize a longitudinal research design to empirically assess the long-term and dynamic benefits of various types of strategic orientation. Third, this paper only explores the relationships between a limited aspects of strategic orientations and NPD performance. However, we believe many other organizational factors may play an important role in affecting the NPD performance outcomes or shaping this NPD process. Future research should examine how additional dimensions of strategic orientation, such as entrepreneurial orientation and learning orientation, may influence NPD performance and firm financial performance differently in a digital context. Finally, future research is also encouraged to extend this stream of research by theorizing and empirically examining how other organizational or environmental factors, such as knowledge gaps, path dependence, and market uncertainty, may shape the relationship between different dimensions and firm performance.

5.4. Conclusions

Strategic orientation is an important driver for successfully developing new products, creating competitive advantages, and promoting sustainable growth. Building on a RBV and its extended dynamic capabilities theory, this study constructs a new theoretical framework to explore the role of technology orientation and customer orientation in predicting firms' digital capabilities and NPD performance within the context of digital transformation. In addition, we further investigate the moderating role of CSR in the relationship between strategic orientation and NPD performance. Using data from a sample of 174 Chinese manufacturing firms, we used a structural equation modelling approach to empirically test our arguments. The findings suggest that technology orientation and customer orientation play an important role in promoting firms' digital capabilities which, in turn, positively impact NPD performance. Furthermore, we find that the two dimensions of strategic orientation have different effects on NPD performance, with technology orientation making a more significant direct contribution to NPD performance. We also find that CSR moderates the relationship between customer orientation and NPD performance, with higher CSR being associated with a greater contribution of customer orientation to NPD performance. This provides new insights into non-market mechanisms through which firms can compensate for their strategically oriented practices in the NPD process.

Overall, our study explores the boundary conditions of corporate strategy in the digital environment in greater depth by integrating the RBV, dynamic capabilities, and stakeholder-related literature, and reviewing prior research in the field. The study enriches our understanding of how organizational strategic orientation specifically affects NPD performance. We will continue to focus on the limitations of the paper and explore them urther.

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Abbreviations

CSR	Corporate Social Responsibility
NPD	New Product Development
RBV	Resource-Based View
SMEs	Small and Medium-Sized Enterprises

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An Explorative Study of Korean Venture Companies: Do CSR and Company Competitiveness Improve Non-Financial and Financial Performance?

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Abstract: For the sustainable growth of venture companies, this explorative study aimed to comprehensively analyze the factors affecting their performance. In addition, this study attempted to verify whether different or similar performance management should be performed according to the difference in characteristics of venture companies. In this study, corporate performance was classified into non-financial and financial performance and analyzed by dividing it into quantitative and qualitative growth. As factors influencing performance, this study analyzed corporate competitiveness compared to competitors and the number of CSR types in which companies participate. In addition, it intended to provide realistic implications and academic contributions to the performance management of venture companies by verifying whether differences in characteristics such as a company's start-up business year, growth stage, and industry should be reflected in corporate performance management as control variables.

Keywords: corporate social responsibility; firm performance; strategic competitiveness; MCF analysis

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1. Introduction

Given that the basic goals of a company are survival and growth, corporate social responsibility (CSR) has become an important core concept for sustainable growth regardless of the size and industry of the company. In the past, CSR was regarded as a voluntary and charitable effort or recommendation for a company. However, it is now becoming a core and inevitable social demand and essential task of sustainable management for corporate survival and growth. As it has become an important strategic tool for sustainable growth, active research is being conducted on CSR and management performance; however, most of the research has been conducted mainly by large companies. Therefore, research on SMEs or venture companies other than large companies is very scarce [1,2]. In particular, research on venture companies tends to be concentrated in their early start-up stages [3]; thus, access to more diverse stages is needed for the sustainable growth of venture companies.

In particular, the Korean government continues to provide policy support for the growth of technology start-ups and venture companies, suggesting "start-ups and innovative growth led by small and medium-sized ventures." However, according to the "Venture Business Precision Survey" released in 2020, the survival rate was only 29% after five years of start-up, although start-up has increased. When comparing the management performance of large companies, SMEs, and venture companies, the net profit ratio of sales is 3.1% for large companies, 2.2% for small and medium-sized companies, and 0.5% for venture companies, respectively. Therefore, it is time for active CSR research on venture companies for their sustainable growth.

Although the Korean government's interest and investment in venture companies have increased, research on their survival and growth is still insufficient. In addition, CSR is being studied and practiced as an important factor in the business environment,

while research on the impact of CSR on venture companies is still insufficient. Therefore, the aim is to conduct an exploratory study that complements the limitations of previous studies and analyzes the factors affecting the performance of venture companies for their sustainable growth. To this end, an empirical study was conducted on the original data of the Venture Business Precision Survey (2020), which was conducted on government-approved venture companies. In this study, in addition to regression analysis with SPSS (v22.0, IBM: Armonk, NY, USA), we intend to comprehensively analyze the factors affecting a company's performance through path analysis with AMOS (v22.0, IBM: Armonk, NY, USA). Moreover, this study attempts to add cross-validity analysis between groups by MCF to verify whether different or similar performance management should be practiced according to the difference in characteristics of venture companies. It is intended to present realistic management implications for venture companies by comprehensively analyzing their management performance.

This paper consists of five sections. Section 2 summarizes previous studies and presents the purpose of the study, and Section 3 introduces variable measurement and analysis data in the research method. Section 4 presents the results of the empirical analysis, and Section 5 presents the conclusions, contributions, and limitations of this study.

2. Literature Review

2.1. Firm Performance

The performance of social responsibility refers to the visible effects of companies and organizations practicing social responsibility. In general, studies on the performance of social responsibility have mainly focused on financial performance [1,4–9], but non-financial performance [7,10–12] is also being studied. Financial performance refers to a performance that can be expressed in monetary terms. In general, this is an achievement that can be confirmed by financial statements and refers to the items of indicators and indices that can be calculated by such statements. Non-financial performance refers to a performance that cannot be expressed in money, which generally refers to performance based on qualitative aspects, subjective thoughts, or judgments. Studies have found that social responsibility has a positive effect on financial performance [1,2,6–8]. Pava and Krausz [7] found that a company that meets social responsibility has much better financial performance, or at least similar to that of a company that does not. Waddock and Graves [8] found that corporate social performance is positively connected to both current and future financial performance. Cummings [6] found that ethical portfolio selection is superior in terms of financial performance. In particular, it was suggested that ethical investment trusts are likely to earn excellent profits in the long run. Chun and Woo [5] confirmed that CSR activities did not affect management performance during the start-up or early growth period of venture companies, but companies that performed active CSR activities during the period of rapid growth showed superior management performance. Bahta et al. [13] found that in the case of SME companies located in Asmarashi, CSR has a direct positive effect on financial performance through the company's reputation. Khattak et al. [2] found that CSR also had a positive effect on environmental performance, financial performance, and innovation performance in Pakistan SMEs. However, some studies have found no or negative impact of social responsibility activities on financial performance [4,14,15]. Aupperle et al. [4] found that the cost of practicing social responsibility causes financial instability. Brammer et al. [14] said that, as result of studying corporate social performance and stock returns, although it could not be rationalized fragmentary, a negative relationship was found between social responsibility and financial performance. Nelling and Webb [15] found the relationship between CSR and financial performance to be insufficient compared to previous studies, which occurs in shareholder-centered cases. Their study suggests that stock market performance refers to the company's investment in CSR centered on labor relations rather than CSR activities that affect financial performance. Their study stated that CSR is a concept reflected in invisible corporate characteristics rather than financial performance.

Previous studies on social responsibility and corporate management performance have verified that the practice of social responsibility has a positive effect on financial performance [1,2,16,17]. This is also linked to the social atmosphere or social expectations of companies. Therefore, the results of these studies seem to justify encouraging the practice of social responsibility activities by offsetting the cost required to practice such activities for private companies seeking profit [1,2,16,17]. Research on the non-financial performance approach is a cognitive evaluation of organizational members, and various non-financial performances such as customer satisfaction [10], organizational trust [12], organizational commitment [18], turnover rate, and work satisfaction [11] are studied.

Therefore, this study focuses on the visible effects of corporate performance, especially to analyze financial and non-financial performance, encompassing both quantitative and qualitative growth. To this end, this study measures technological performance as a qualitative aspect of non-financial performance, total employees as a quantitative aspect, corporate sales as a quantitative aspect of financial performance, and a company's net profit as a qualitative aspect.

2.2. Corporate Social Responsibility

CSR refers to the activities that companies perform to meet the social obligations that their stakeholders expect and demand from them. Companies voluntarily try to analyze and accept stakeholders' social and environmental interests in their business areas. CSR can be defined as achieving continuous interaction with companies and stakeholders through this process. Compared to large corporations, it is a general idea that SMEs face difficulties and restrictions in practicing CSR due to the lack of human and material resources and economic poverty [19]. However, small and medium-sized venture companies cannot satisfy various stakeholders and meet social needs for CSR. In particular, a high level of CSR has been required regardless of the size and industry of the company in recent years, and information on the type and level of CSR has been disclosed to the public, directly affecting consumers' consumption decisions [13]. Accordingly, CSR research is expanding to SMEs and venture companies. Bahta et al. [1] found that CSR has a direct positive effect on financial performance through the company's reputation in SME companies located in Asmarashi. Khattak et al. [2] found that CSR has a positive effect on various performances factors (environmental, financial, and innovation) in SMEs in Pakistan. Hammann et al. [16] analyzed the effect of CSR activities on corporate performance for small and medium-sized enterprises in Germany. According to their research, CSR activities for employees, customers, and society were found to have a positive effect on financial performance. Kim et al. [20] analyzed the effect of CSR activities on corporate image and corporate product purchase intention for SMEs. According to their study, economic responsibility activities and charitable responsibility activities have a positive effect on the corporate image even during CSR activities. Lee and Yang [17] analyzed the effect of CSR activities on management performance through mediating effects of organizational culture types for small and medium-sized venture partners in Samsung Electronics' mobile business in Hanoi, Vietnam. According to their research, CSR activities had a positive effect on financial and non-financial performance, and at this time, relational and hierarchical cultures showed mediating effects.

Therefore, this study aims to analyze the effect of CSR participation and other kinds of participation on corporate performance by measuring the different types of CSR activities that companies practice.

2.3. Strategy Competitiveness

Companies always try to performance better compared to competitors within a specific industry and continue to pursue it. Various factors allow companies to secure competitiveness, but they can be largely divided into business process advantage, resource advantage, know-how advantage, market(share) advantage, product/service advantage, customer advantage, technology advantage, and human capital advantage [21]. An in-depth analysis

of competitiveness is needed because strategies and performances may differ due to the competitive advantage of companies. However, studies on SME competitiveness and performance are limited [22–24]. O'Farrell and Hitchens [24] analyzed the competitiveness and performance of small manufacturing firms in Scotland and Ireland. According to their matched pairs of comparative analysis, several policies were drawn. Man et al. [23] investigated relationships between entrepreneurial characteristics and firm performance of SMEs. Their study provided evidence of the direct and indirect contribution of the entrepreneur's opportunity, relationship, innovative, human, and strategic competencies in affecting the long-term performance of an SME. Baporikar [22] analyzed the influence of business competitiveness on SME performance in Namibia. The findings show that although ABR has a sound credit rating with local financial institutions and opportunities for growth, it also needs to invest in equipment to become more competitive and strengthen its market.

Therefore, this study aims to analyze the effect of competitiveness on corporate performance by dividing and measuring the competitiveness of companies compared to competitors into development, manufacturing, and marketing capabilities.

3. Methodology

3.1. Measurement

This study was conducted according to the research model shown in Figure 1, based on previous studies. To analyze the factors affecting the management performance of venture companies, with performance as a dependent variable, this study includes the quantity and quality of non-financial performance and financial performance. As for quantity non-financial performance, the total number of employed workers was measured. For quality non-financial performance, the total number of patent applications and registrations were counted. As for quantity financial performance, the total sales of a company was measured. For quality financial performance, the net profit of a company was measured. As for the independent variable, this study includes two factors: corporate competitiveness and CSR. A survey measures a company's competitiveness by the degree to which it perceives that a company has more tangible and intangible resources than its competitors, and R&D capability, manufacturing capability, and marketing capability are measured using a 5-point Likert score (1 = very low to 5 = very high). CSR is measured by the number of CSR types that a company is practicing. Moreover, the start-up business year, corporate growth stage, and industry were considered as control variables. The variables used in this study are summarized in Table 1.

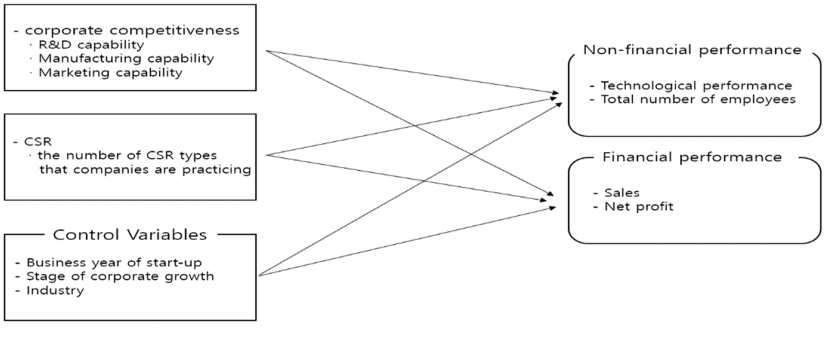

Figure 1. Research Model.

Table 1. Measurement of Variables.

Type of Variables			Items
Dependent variable	Non-financial performance	Technological performance	Number of patent applications and registrations (patent rights, utility model rights, design rights, trademark rights, etc.)
		Total number of employees	Total number of employed workers (regular workers + non-regular workers)
	Financial performance	Sales	Sales of a company (1 Mil.)
		Net profit	Net profit of a company (1 Mil.)
Independent variable	Corporate competitiveness (Compared to the competitor)	R&D capability	The level of competitiveness of a company compared to its perceived competitors (choose: 1—very low, 2—low, 3—average, 4—high, 5—very high)
		Manufacturing capability	
		Marketing capability	
	CSR		The number of CSR types that companies are practicing (range: 0~6) (choose all relevant items: donation, talent donation, creating shared value, community service, sponsorship, etc.)
Control variable	Business year of start-up		(choose: 1—under 3 years after establishment, 2—4–10 years, 3—11–20 years, 4—Over 21 years)
	The stage of corporate growth		What do you think is the growth stage of a company? (choose: 1—founding period, 2—early growth period, 3—rapid growth period, 4—maturity period, 5—decline period)
	Industry		(choose: 1—self-manufacturing, 2—manufacturing + outsourcing, 3—all outsourcing, 4—non-manufacturing)

3.2. Data

This exploratory study aims to analyze the factors affecting the performance of venture companies. This study used raw data from the Venture Business Precision Survey (2020), which is a government-approved notice with public confidence. The Venture Business Precision Survey is the annual survey conducted by the Ministry of SMEs and Start-ups and the Korean Venture Business Association. The detailed survey of venture companies is highly reliable because the CEO, executives, and managers directly respond, and it consists of systematically structured questionnaires and the accumulate data are considered to have high validity for use in research. The Venture Business Precision Survey (2020) used in this study was based on 2500 data samples provided by the public data portal (data.go.kr, accessed on 13 September 2021) by surveying and analyzing 36,503 venture-certified companies as of the end of December 2019. In particular, 2200 items of data were used in this study, excluding 300 participants who did not participate in the CSR survey. Table 2 summarizes the characteristics of the samples used in this study.

This exploratory study aims to analyze the factors affecting the performance of venture companies using frequency analysis, correlation analysis, and regression analysis with SPSS 22. In addition, this study used path analysis with AMOS 22. Moreover, to verify whether different management should be performed according to the differences in the characteristics of venture companies, this study used cross-validity analysis between groups by MCF to confirm whether similar management is irrelevant.

Table 2. Sample Characteristics.

N = 2200		N	%
Business year	under 3 years	128	5.8
	4–10 years	846	38.5
	11–20 years	872	39.6
	over 21 years	354	16.1
Business growth stage	founding period	34	1.5
	early growth period	398	18.1
	rapid growth period	771	35.0
	maturity period	982	44.6
	decline period	15	0.7
Industry	Self-manufacturing	739	33.6
	Manufacturing + Outsourcing (M&O)	620	28.2
	All-outsourcing	100	4.5
	Non-manufacturing	741	33.7

4. Results

Before analyzing the causal relationship of the factors affecting the management performance of venture companies, this study performed correlation analysis and presented the results in Table 3. The highest correlation is 0.696 for the total number of workers and sales. Mean and standard deviation (S.D) of the independent and dependent variables are shown in Table 3.

Table 3. Correlation Analysis Results.

	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11
1	2.66	0.81	1										
2	3.25	0.81	0.618 ⁑	1									
3	2.38	1.26	−0.139 ⁑	−0.030	1								
4	3.72	0.65	0.104 ⁑	0.059 ⁑	−0.124 ⁑	1							
5	3.41	0.81	0.190 ⁑	0.114 ⁑	−0.233 ⁑	0.453 ⁑	1						
6	3.29	0.69	0.156 ⁑	0.092 ⁑	−0.143 ⁑	0.560 ⁑	0.476 ⁑	1					
7	0.33	0.56	0.165 ⁑	0.143 ⁑	−0.100 ⁑	0.175 ⁑	0.236 ⁑	0.197 ⁑	1				
8	12.98	24.53	0.294 ⁑	0.193 ⁑	−0.199 ⁑	0.242 ⁑	0.238 ⁑	0.217 ⁑	0.227 ⁑	1			
9	52.18	67.46	0.326 ⁑	0.227 ⁑	−0.069 ⁑	0.217 ⁑	0.245 ⁑	0.286 ⁑	0.262 ⁑	0.367 ⁑	1		
10	17605.29	28480.94	0.277 ⁑	0.186 ⁑	−0.143 ⁑	0.121 ⁑	0.213 ⁑	0.241 ⁑	0.251 ⁑	0.335 ⁑	0.696 ⁑	1	
11	429.47	4571.62	0.027	0.017	−0.041	0.040	0.044 ⁎	0.053 ⁎	0.060 ⁑	0.094 ⁑	0.215 ⁑	0.354 ⁑	1

Note: ⁑ < 0.01, ⁎ < 0.05 1. Business year, 2. Business growth stage, 3. Industry, 4. R&D capability, 5. Manufacturing capability, 6. Marketing capability, 7. Number of CSRs practiced type, 8. Number of registered industrial property rights, 9. Total number of employees, 10. Sales, 11. Net profit.

To analyze the factors affecting the management performance of venture companies, this study conducted a step-wise regression analysis for each management performance, and the results are summarized in Table 4. All analyses were conducted in two stages to examine the factors that affect management performance. In step 1 (M1), the effects of the start-up business year, corporate growth stage, and industrial dummy variables were analyzed by considering only the control variables. In step 2 (M2), corporate competitiveness and CSR factors were added and analyzed along with the control variables.

Table 4. Step-wise Regression Analysis Results.

B(t)			Non-Financial Performance				Financial Performance			
			Technological Performance		Total Number of Employees		Sales		Net Profit	
			M1	M2	M1	M2	M1	M2	M1	M2
Control variable	Business year of start-up		0.250 ⁂ (9.656)	0.212 ⁂ (8.368)	0.293 ⁂ (11.308)	0.241 ⁂ (9.678)	0.240 ⁂ (9.127)	0.194 ⁂ (7.607)	0.022 (0.789)	0.011 (0.383)
	Business growth stage		0.033 (1.291)	0.023 (0.918)	0.040 (1.551)	0.026 (1.083)	0.033 (1.262)	0.019 (0.755)	0.004 (0.153)	0.000 (0.018)
	Industry	Self-manufacturing	del.	0.137 ⁂ (5.920)	del.	−0.027 (−1.206)	del.	0.076 ⁑ (3.254)	del.	0.040 (1.572)
		Manufacturing + outsorcing	−0.049 ⁕ (−2.112)	0.087 ⁂ (3.823)	−0.043 † (−1.882)	−0.059 ⁑ (−2.607)	−0.045† (−1.925)	0.037 (1.582)	−0.057 ⁕ (−2.329)	−0.017 (−0.685)
		All-outsourcing	−0.053 ⁕ (−2.521)	0.029 (1.440)	−0.078 ⁂ (−3.678)	−0.066 ⁑ (−3.308)	−0.055 ⁑ (−2.586)	−0.005 (−0.262)	−0.021 (−0.952)	0.001 (0.045)
		Non-manufacturing	−0.182 ⁂ (−7.780)	del.	−0.030 (−1.263)	del.	−0.122 ⁂ (−5.131)	del.	−0.051 ⁕ (−2.055)	del.
Corporate competitivenes	R&D capability			0.134 ⁂ (5.512)		0.042 † (1.767)		−0.064 ⁑ (−2.615)		0.008 (0.286)
	Manufacturing capability			0.058 ⁕ (2.466)		0.067 ⁑ (2.900)		0.066 ⁑ (2.777)		0.009 (0.345)
	Marketing capability			0.036 (1.466)		0.161 ⁂ (6.615)		0.169 ⁂ (6.780)		0.030 (1.103)
CSR	The number of CSR types that companies are practicing			0.133 ⁂ (6.537)		0.165 ⁂ (8.292)		0.171 ⁂ (8.353)		0.048 ⁕ (2.146)
	Adj. R^2		0.111	0.171	0.111	0.200	0.087	0.154	0.002	0.004
	F(Sig)		55.810 ⁂	51.450 ⁂	56.082 ⁂	62.226 ⁂	42.821 ⁂	45.513 ⁂	1.662	2.012 ⁕

Note: ⁂ < 0.000, ⁑ < 0.01, ⁕ < 0.05, † < 0.1.

First, it increased from 11.1% to 17.1% when comparing the explanations of M1 and M2 in technical performance analysis, which is a qualitative non-financial performance. In other words, technological performance is better explained when competitiveness and CSR are added than only reflecting corporate characteristics. As a result of the analysis, the order of significant influence on technological performance was found to be the start-up business year (0.212), self-manufacturing (0.137), R&D capability (0.134), CSR practice number (0.133), manufacturing + outsourcing (0.087), and manufacturing capability (0.058). In other words, in terms of corporate characteristics, the longer the start-up operating year and the higher the manufacturing and manufacturing + outsourcing industries rather than outsourcing or non-manufacturing businesses, the higher the technological performance. In terms of corporate competitiveness, the better the R&D and manufacturing capabilities and the higher the number of CSR practices, the higher the technological performance.

Second, it increased from 11.1% to 20.0% when comparing the explanations of M1 and M2 in the analysis of the total number of employees, which is a quantitative non-financial performance. In other words, the total number of employees as a non-financial performance is better explained when competitiveness and CSR are added than when only corporate characteristics are reflected. As a result of the analysis, the order of significant impact on the performance was found to be the start-up operating year (0.241), CSR practice number (0.161), marketing capability (0.067), all-outsourcing (−0.066), and manufacturing + outsourcing (−0.059). In other words, in terms of corporate characteristics, the longer the start-up operating year, the more employees there are and the fewer total employees in outsourcing and manufacturing + outsourcing industries than in manufacturing and non-manufacturing industries. In terms of corporate competitiveness, the better the marketing and manufacturing capabilities, the larger the total number of employees, and the larger the number of CSR practices, the larger the total number of employees.

Third, when comparing the explanations of M1 and M2 in sales analysis, which is quantitative financial performance, it increased from 8.7% to 15.4%. In other words, sales performance is better explained when competitiveness and CSR are added than when only reflecting corporate characteristics. As a result of the analysis, the order of significant impact on performance was found to be the start-up business year (0.194), CSR practice number (0.171), marketing capability (0.169), self-manufacturing (0.076), manufacturing capability (0.066), and R&D capability (−0.064). In other words, in terms of corporate characteristics, the longer the start-up business year, the greater the sales, in particular, of that of the manufacturing industry than other industries. In terms of corporate competitiveness, the better the marketing and manufacturing capabilities, the larger the sales, while the better the R&D capabilities, the lower the sales, and the larger the number of CSR practices, the larger the sales.

Finally, in the analysis of net profit, which is a qualitative financial performance, M1 showed insignificant results, while M2 showed sufficient and explanatory power of 0.4%. The net profit performance has a more meaningful explanation when competitiveness and CSR are added rather than corporate characteristics. The analysis revealed that the CSR practice number (0.048) was the only variable that significantly affected net profit performance. In other words, it seems that companies that practice CSR in various ways tend to have higher net profit during the term.

To verify the comprehensive impact and degree of explanation between variables, this study used path analysis and summarized the results in Table 5. Path analysis explored the effect of corporate competitiveness and CSR on non-financial performance and financial performance, excluding control variables; the model fit value results were CMIN = 12.300, DF = 10, p = 0.000, CMIN/DF = 1.230, GFI = 0.999, NFI = 0.997, IFI = 0.997, CFI = 0.997, and RMSEA = 0.072. The analysis revealed that corporate competitiveness and CSR explained 10.8% of technological performance, 13.6% of total employment performance, 11.1% of sales performance, and 0.6% of net profit performance. The influence values were slightly different compared to the regression analysis results, but the significant influence and direction were almost identical. In terms of the size order of the impact, the number of CSR practice (0.166), development capabilities (0.129), and manufacturing capabilities (0.122) had a significant positive effect on technological performance. In addition, the path analysis results showed that marketing competency (0.059) also had a positive effect on technological performance. The number of CSR practice (0.198), marketing capabilities (181), and manufacturing capabilities (0.095) had a positive effect on total employees. The number of CSR practice (0.201), marketing capability (0.189), and manufacturing capability (0.107) had a positive effect on sales, and development capability (−0.068) also showed a significant negative effect. Finally, only the number of CSR practices (0.049) had a significant effect on net profit. Overall, we confirmed that the influence of CSR was the variable that had the greatest influence on corporate performance.

Table 5. Comprehensive Relation Result by Path Analysis.

Dependent Variable		Independent Variable	St. Estimate	S.E.	C.R.	p
Non-financial performance	Technological performance (0.108)	R&D capability	0.129	0.944	5.121	***
		Manufacturing capability	0.112	0.727	4.681	***
		Marketing capability	0.059	0.904	2.302	0.021
		The number of CSR types that companies are practicing	0.166	0.906	7.973	***
	Total number of employees (0.136)	R&D capability	0.038	2.546	1.542	0.123
		Manufacturing capability	0.095	1.963	4.038	***
		Marketing capability	0.181	2.438	7.202	***
		The number of CSR types that companies are practicing	0.198	2.445	9.645	***

Table 5. *Cont.*

Dependent Variable		Independent Variable	St. Estimate	S.E.	C.R.	*p*
Financial performance	Sales (0.111)	R&D capability	−0.068	1087.635	−2.723	0.006
		Manufacturing capability	0.107	838.351	4.484	***
		Marketing capability	0.189	1041.490	7.423	***
		The number of CSR types that companies are practicing	0.201	1044.400	9.676	***
	Net profit (0.006)	R&D capability	0.007	185.671	0.265	0.791
		Manufacturing capability	0.013	143.115	0.523	0.601
		Marketing capability	0.033	177.793	1.235	0.217
		The number of CSR types that companies are practicing	0.049	178.290	2.246	0.025
CMIN = 12.300, DF = 10, p = 0.000, CMIN/DF = 1.230, GFI = 0.999, NFI = 0.997, IFI = 0.997, CFI = 0.997, RMSEA = 0.072						

Note: *** < 0.000.

In addition, in this study, cross-validity analysis between groups by MCF was added to verify whether different or similar performance management should be performed according to the difference in characteristics of venture companies. This study attempted to examine the start-up business year, corporate growth stage, and industry reflected as control variables in this study among the characteristics of venture companies. In particular, cross-validity analysis between groups by MCF was added to see if there was a group difference between the start-up business year and industry, which was found to have a significant effect on corporate performance (see Table 4). Through MCF analysis, we attempted to verify whether group comparison was meaningful. Based on the results of the group comparison, it is expected to provide implications for whether differences between groups are necessary for the performance management of venture companies. In this study, the p-value of the x^2 difference between constraints is summarized in Table 6 by analyzing the MCF group difference between the start-up operating year and the industry that showed a significant effect in Table 4. As a result of the analysis, both the p-value of the x^2 difference in the start-up operating year and the industry were 0.000. In other words, group comparison cannot be achieved because group homogeneity has not been secured, and group comparison is meaningless. In other words, the effect of CSR and competitiveness on corporate performance, which is the research model of this study, is not related to the difference in start-up business year or industry. Therefore, it means that even if the start-up business year and industry are different, corporate performance can be managed the same or similarly.

Table 6. Result of Group Cross-Validation Analysis by MCFAs.

	x^2		Δx^2	p of Δx^2
Business Year	Unconstrained Model	20.164	128.797	0.000
	Measurement Weights Model	148.961		
Industry	Unconstrained Model	9.317	148.143	0.000
	Measurement Weights Model	157.460		

5. Conclusions

5.1. Implication and Contribution

For the sustainable growth of venture companies, this exploratory study attempted to comprehensively analyze the factors affecting their performance. In addition, this study attempted to verify whether different or similar management should be performed according to the difference in characteristics of venture companies. In analyzing corporate performance, non-financial and financial performance were classified, and quantitative and qualitative were also classified. In this study, corporate competitiveness compared to

competitors and the number of CSR types in which companies participate were analyzed as major factors influencing performance. In addition, the aim was to provide realistic implications and academic contributions to the performance management of venture companies by verifying whether differences in characteristics such as a company's start-up business year, growth stage, and industry should be reflected as moderating variables.

Based on the analysis results of this study, five implications can be proposed for managing corporate performance. First, technological performance was analyzed with non-financial and qualitative growth performance variables, which were measured by the number of patent applications and registrations. As a result of the analysis, it was found that the technological performance increased as the R&D and manufacturing capabilities representing corporate competitiveness increased. In addition, it was found that the more diverse the number of CSR practice, the higher the technological performance increased. Therefore, if a venture firm wants to improve technological performance, that is, to increase the number of patent applications and registrations, it must improve its R&D and manufacturing capabilities compared to those of the competitors. To this end, companies will make investments and practices in improving actual development and manufacturing capabilities. Moreover, not only should they participate in CSR but also carry out various types of CSR activities. Second, the total number of employees was analyzed as non-financial and quantitative growth performance variables, which were measured by the number of regular and non-regular workers. As a result of the analysis, as the manufacturing and marketing capabilities representing corporate competitiveness increase, the total number of employees increased. In addition, the total number of employees increased as the number of CSR practice increased. Therefore, if venture companies want to achieve quantitative growth with an increasing number of employees, they will have to invest and practice higher manufacturing and marketing capabilities than their competitors. Moreover, not only should they participate in CSR but also carry out various CSR activities. Third, sales were analyzed as financial and quantitative growth performance variables, measured as corporate sales (million won). On the one hand, the analysis revealed that the increase in development capabilities representing corporate competitiveness reduced sales, while manufacturing capabilities and marketing capabilities increased sales. Therefore, for sales growth, companies should invest and practice improving manufacturing and marketing capabilities compared to competitors. On the other hand, it was found that an increase in development capability negatively affects sales, but it is difficult to intentionally reduce the development capability, and more research should be conducted on the relationship between development capability and sales. For example, sales may have decreased due to development costs invested in increasing development capabilities, or there may be a time gap between development capabilities and sales. Moreover, not only should the companies participate in CSR but also carry out various types of CSR activities. Fourth, net profit was analyzed as a financial and qualitative growth performance variable, which was measured as the company's net profit (million won). The analysis showed that only the number of CSR practice types in this study model had a significant effect on net profit. Therefore, to increase net profit during the term, it is necessary not only to participate in CSR but also to perform various types of CSR activities. Fifth, as factors affecting performance, the start-up operating year and industry had a significant effect, especially on technological performance, total employees, and sales. Therefore, this study attempted to verify whether performance management should be implemented differently depending on the start-up business year and industry. Consequently, it was found that there was little difference between the start-up business year and the industry. Therefore, it would be okay to implement the same or similar management regardless of the difference in the start-up year of the company and the difference in the industry.

In addition, this study makes several academic contributions. This is an empirical study on Korean venture companies, which has been insufficient in the existing literature. In particular, as few studies have empirically analyzed the relationship between venture

company performance and CSR, it can be used as a basic study for future research related to the sustainable growth of venture companies.

5.2. Limitations and Future Study

Despite the above implications, this study has three limitations for future studies to overcome. First, it was analyzed using the influencing variable and the result variable at the same time point. However, the influence of competitiveness and CSR can affect performance over time. In addition, performance may affect competitiveness and CSR. Therefore, in future studies, it is necessary to conduct a time series analysis [25] that can reflect the time difference between the influencing variable and the result variable. Second, in this study, only competitiveness and CSR were considered as factors influencing the performance of venture companies. In Korea, however, the use of various venture support systems can be an important factor in situations where there are more start-ups based on national and local government support than self-sustaining venture companies, and the presence of partner organizations can be an important factor. Therefore, future studies need to reflect the effects of venture company support policies and programs, as well as the types and relationships of partner organizations [21]. Third, in this study, CSR was analyzed as the number of CSR types practiced by companies. To analyze the effectiveness of CSR in depth, analysis by CSR type [26] seems to give more specific implications to various companies.

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Corporate Social Responsibility, CEO Compensation Structure, and Corporate Innovation Activities

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Abstract: This study empirically investigated the economic effect of CSR initiatives on innovation by examining Korean firms. Our primary objective of this study was to explore how a CEO compensation system can affect the CSR-innovation relationship. An integrated model of the impact of CSR on innovation activities was developed through analyzing various CEO compensation components such as structure, type, mix, and distribution. We identified the CEO compensation system that more suitably supports CSR in driving innovation performance improvement, and empirically examined a compensation system that enhances corporate innovation by creating a good alignment with CSR. Using a longitudinal data, we empirically tested the interactive effect of a CSR and compensation system of CEO in Korean publicly traded companies. Our empirical findings concerning the interaction between CSR strategies and CEO compensation schemes hold practical implications for establishing and implementing a suitable human resource system to improve organizational competitiveness.

Keywords: corporate social responsibility; innovation; CEO compensation structure; social exchange; equity

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1. Introduction

Corporate social responsibility (CSR) is defined as the obligation of a company to pursue and make decisions for policies that are desirable from the point of view of social goals and values [1]. In recent years, CSR has moved away from the narrowly defined imperatives of "social contribution" and "transparent management" toward fulfilling economic, environmental, and ethical responsibilities to support long-term corporate stability and sustainability in a dynamic environment. The definition is being expanded to "creating shared value," a strategic concept that stimulates sustainable growth [2]. Recent theoretical studies and anecdotal evidence suggest that CSR activities can lead to process and product innovation by promoting investment in research and development (R&D), a major driver of corporate innovation [3,4]. For example, some firms have developed new business models with special emphasis on product and service innovations through CSR activities [5], which can in turn lead to improve corporate image among consumers.

Despite the popularity of CSR activities as strategic initiatives to innovate and secure competitive advantage, empirical studies on CSR-innovation relationship are relatively absent or are characterized, at best, by mixed results [3,4]. Moreover, the CSR-innovation link has not received much attention in the Korean context. However, anecdotal evidence suggests that there is a growing number of listed companies in Korea that utilize CSR as a driving force for innovation, thereby enhancing the company's competitive advantage [5]. Thus, one purpose of the study was to empirically investigate the economy-wide average effect of CSR initiatives on innovation by examining all publicly traded firms in Korea. Furthermore, our primary objective of this study was to explore how CEO compensation system can affect the CSR-innovation relationship. The empirical inconsistency of the impact of CSR on innovation may indicate that firms differ widely in their ability to deal with the impact of CSR on innovative efforts. Additionally, it is expected that CEO

incentives play key role in influencing both CSR and corporate innovation decisions that are often associated with high-risk projects and continuously allocated resources for the sake of conflicts of interest among stakeholders [6]. Combined together, we argue that a certain choice of CEO compensation component may be better able to create a positive relationship between CSR and innovative activities.

This study explored a comprehensive understanding of the role of CEO compensation design in the relationship between CSR and innovation and presented empirical evidence to show the relationship. Specifically, certain elements of CEO compensation can increase the effect of CSR on innovation activities. As investment invariably accompanies CSR and corporate innovation, conflicts between management and shareholders regarding these activities frequently arise [6]. Therefore, CEO compensation must be designed—by considering elements such as risk premiums and incentives—keeping these possible conflicts of interest in mind to ensure that innovation performance from CSR is enhanced [7,8]. Several recent studies confirm that CEO salary level has a negative effect on CSR [9,10]. However, CEO compensation level alone is insufficient to explain the link between CSR and innovation activities. Therefore, in this study, an integrated model of the impact of CSR on innovation activities was developed through analyzing major CEO compensation design variables such as structure, type, mix, and distribution. Put differently, we theoretically explored the design variables of CEO compensation that more suitably support CSR in driving innovation performance improvement, and identified a compensation system that enhances corporate innovation by creating greater synergy and alignment with CSR.

Using a longitudinal data, we empirically tested the interactive effect of CSR and compensation system of CEO in Korean publicly traded companies, including compensation structure (percentage of performance-based compensation to total compensation), compensation type (the ratio of stock-linked performance to total pay for performance), and reward distribution (the wage gaps within the top management team and between the CEO and the average employee). We analyzed the compensation structure and details of individual, registered executives who received a remuneration of 500 million Korean won or more. Compensation details of executives meeting this criterion must be disclosed in accordance with the revision of the Capital Market Act at the end of 2013. Overall, this study proposed the theoretical and practical implications of managerial compensation structure for the impact of CSR on innovation.

2. Theoretical Background and Hypotheses

2.1. CSR and Innovation Activities

Innovation is the new adoption of a design, system, policy, program, process, product, or service created and purchased within an organization [11]. Recent studies have discussed that CSR has a positive effect on corporate innovation activities [12,13]. For example, a study by the European Commission found that CSR creates opportunities for companies to adopt a long-term, strategic approach to developing innovative products, services, and business models that provide higher quality and more productive jobs [14]. Importantly, CSR is reported to play a role in attracting individuals to explore [14,15]. In addition, CSR-driven innovation values oriented toward products and services with a social, environmental, or sustainability purpose. Specifically, companies often apply CSR to productive processes and practices that may involve R&D spending or require technological change [16]. For instance, Bansal [17] showed that innovations in processes and products have been pursued in order to reduce carbon dioxide emissions. As such, CSR provides opportunities for innovation and can be spurred by social, environmental, and sustainability drivers to create new ways of working, products, services, processes, and new market spaces.

Moreover, CSR can create a workplace environment in which external stakeholders actively participate, identify new business opportunities through active alternatives to social tasks, and encourage employees to think and work in more innovative ways [18]. Essentially, CSR activities help companies form new relationships and strengthen exist-

ing ones, thus, gaining broader access to important external information—such as the knowledge and expertise of various external stakeholders—that drives innovation. Additionally, external information complements internal knowledge and advances technological innovation capabilities [19,20].

Several studies have suggested a positive effect of CSR on R&D intensity [21,22]. Given that companies are more likely to address social, environmental, ethical, human rights, and consumer concerns through CSR activities, they enjoy trust and loyalty among stakeholders, including customers, employees, investors, business partners, and communities [2,23]. A positive relationship between CSR and innovation activities has been established. Therefore, based on findings from previous studies, we retest the following hypothesis:

Hypothesis 1. *CSR has a positive relationship with corporate innovation activities.*

2.2. CSR, CEO Compensation Structure, and Innovation Activities

2.2.1. Performance Pay as a Percentage of Total CEO Compensation

The CEO is the chief decision-maker who not only manages the company on behalf of shareholders, but also takes responsibility for its performance [24]. CEO compensation is a representative governance mechanism that induces the company to move down and should be designed to be linked with the company's core activities and performance [25]. Total compensation for CEOs consists of base salary, cash bonus, and equity-based compensation [25,26]. The cash bonus is fixed-cash equivalent compensation—guaranteed by cash incentives and with a cap on compensation—meant as an additional reward for managers who reach a performance standard set by the company. In addition, stock-linked compensation is a generic term for all forms of reward in which employee compensation is linked to stock price, and typically includes stock options and grants [27]. This performance-based pay system refers to a method in which wages are differentially paid according to work performance, and is a way of supplementing the basic wage through the differential payment of bonuses and differential wage increases. Performance-based pay also occurs at the group level, when a performance bonus is paid uniformly to group members when target performance is achieved [9,10].

Most previous studies have examined the effect of CSR on the level of CEO compensation. For example, Cai et al. [28] investigated the impact of CSR on CEO compensation using US corporate data from 1996 to 2010. Their results stated that the CEO of a company with considerable CSR activity should receive less than the CEO of a company with a low level of CSR activity. Similarly, a later study demonstrated the differential effect of CSR based on the CEO's compensation type; base pay and long-term performance pay had a negative effect, but bonuses had no effect [29]. This was an analysis of the effects of separate individual compensation components; however, the compensation structure (i.e., performance pay as a proportion of total compensation) was not considered. Importantly, the reward structure is a direct variable in predicting the risk-seeking behavior of management. As both CSR and innovation activities are risk-bearing long-term investments, management will pursue less risky and short-term alternative strategies if compensation for increased risk is not offered [9].

Thus, CSR activities combined with incentivized risk-taking and behavior can generate synergistic effects on innovation activities. This is because the intensity of pay-for-performance pay can benefit from the alignment of organizational strategic goals and encouraging risk-taking behavior, thereby increasing the innovative climate. Overall, a high proportion of performance-based pay to total compensation is more effective in firms with CSR initiatives and such synergistic interaction has a positive impact on innovation activities. Thus, we propose the following hypothesis:

Hypothesis 2. *The positive relationship between CSR and innovation activities is stronger when the proportion of pay-for-performance pay to total compensation is high.*

2.2.2. Share of Equity-Based Pay in Total CEO Compensation

The types of performance pay discussed above do not always have similar interactions with CSR. CEO performance pay is divided into short- and long-term pay in terms of time frame [26,30]. Jensen and Murphy [26] showed that stock-related compensation is an effective compensation tool that incentivizes decision-making that improves the long-term performance of a company, given that the performance-based portion of the compensation is based on stock price. The cash bonus for CEOs in domestic companies is based on performance evaluation, while stock options are a typical example of a stock-based bonus.

It is expected that the CEO's preference for less risky short-term rewards is negatively related to CSR activities. For example, when CEOs invest in CSR for their own benefit and at the expense of shareholders, CSR performance is positively correlated with cash-based reward ratios [29]. In contrast, if the CEO engages in CSR to increase firm value in line with shareholder interests—or if successful CSR performance improves relationships with other stakeholders, including employees and shareholders—the share-based reward ratio increases according to social performance [29].

In addition, Gan and Park [31] argued for a positive effect between CEOs' management ability and stock-based compensation, supporting that stock option compensation for managers drives long-term decision-making by aligning the interests of shareholders and managers. Stock-based compensation reduces managers' compensation risk, thereby encouraging higher-risk investment decisions [32]. In other words, the more stock managers own, the less incentive compensation must be paid by shareholders [33]. Effective CSR activities are consistently conducted only when performance rewards are received [34–36].

Therefore, a compensation system with a higher proportion of stock-based long-term incentives—rather than with short-term incentives centered on cash bonuses—creates greater synergy with CSR. In particular, stock options, unlike stocks, are long-term incentives that must be held for at least three years after acquisition due to vesting period restrictions. Thus, as the proportion of stock-based incentives excluding cash incentives increases, CEOs adopt longer-term strategies consistent with activities such as CSR and investment in product innovation. Therefore, the relative weight of stock-based compensation to performance-based pay increases the effectiveness of CSR and has a positive effect on innovation performance. Thus, the following hypothesis is proposed:

Hypothesis 3. *The positive relationship between CSR and innovation activities is stronger when the proportion of stock-based compensation to total compensation is high.*

2.2.3. Pay Dispersion between CEO and Top Management Team

Pay dispersion refers to the degree of pay differential constituted by the pay structure of a company and is defined as the difference in the wages of workers within a job or organizational hierarchy [37,38]. In addition, the wage gap can be divided into a vertical wage gap—the wage difference between levels of an organization—and a horizontal wage gap—the wage difference between the same or similar jobs within the organizational hierarchy [37]. Executives within the top management team (TMT) work closely with the CEO to help formulate and implement company strategy, but are sometimes the fiercest contenders for succession to CEO [39–41]. TMT members are reasonably similar in their work experience, perspective, and temperament [42]. These executives are highly motivated and achievement-oriented, and tend to be influenced by the desire for power and position. This demonstrates a tendency to recognize the difference [39].

This study focused on the interaction between the pay differentials or inequity within TMTs and CSR. Although not specifically investigated in previous studies, it is believed that team incentives can reinforce specific attitudes and behaviors to realize the TMT's strategic goals, given that organizational leadership is a shared activity [43]. According to equity theory, individuals rethink the inputs (e.g., time, effort) to their work and the outputs (e.g., rewards) they receive from that work, and consider other tasks and inputs similar to themselves. In comparing ratios, social comparisons are made based on observable

differences, even among executives within the TMT [39,44]. This comparison demonstrates that when TMT members have strong similarities in performance, employment success, and hierarchical position within the firm [42], management overestimates the value of their contributions despite differences such as the quality and quantity of their work, and tends to underestimate the value of the efforts of others [39]. High wage disparities among TMT executives are associated with emotions such as negativity, apathy, social distancing, and jealousy, and with decreased job satisfaction and a high turnover rate [39,45].

Several previous studies have suggested that high wage gaps can lead to high executive turnover [46], which is particularly deleterious to performance in high-tech industries [45]. In addition, in a study of TMTs, the hierarchical reward gap hindered collaboration within peer groups as the reward gap increased, which can in turn lead to decrease organizational performance [45]. While Beaumont and Harris [47] demonstrated differences by industry and corporate ownership, their study supported that a narrow wage structure generally improved corporate performance. In addition, a study of long-term organizational performance supported that the compensation gap between the CEO and top executives had a negative effect on corporate innovation in 75 companies from 14 industries in the United States from 1991 to 1995 [48].

Overall, horizontal pay inequity can exacerbate competition among executives and undermine cooperative efforts, hindering the cooperation essential for CSR and innovation activities [49,50]. Thus, it is predicted that less horizontal pay inequity can provide more potential benefits to firms which pursue CSR by creating a cooperative culture within TMTs. Likewise, a high horizontal pay differential attenuates the positive interaction between CSR and innovation activities. Therefore, the following hypothesis is formulated:

Hypothesis 4. *The positive relationship between CSR and innovation activities is weaker when there is a high pay differential within the TMT.*

2.2.4. CEO-Employee Pay Dispersion

To date, CSR activities have been largely limited to endeavors targeting an organization's external stakeholders, such as shareholders, customers, business partners, and local communities [51]. However, given the recent interest in CSR activities for internal stakeholders (i.e., employees)—mainly in Korea and the United States—related research has been divided by internal versus external stakeholder perspectives. Specifically, internal CSR focuses on CSR activities within the organization to improve the lives and productivity of employees [52]. This process depends on establishing positive exchange relationships between employees and the organization [51–54]. However, the content and effectiveness of internal and external CSR activities may not always be consistent within an organization [55]. For example, in the case of companies that are very active in external CSR, these activities give a positive signal to external parties such as shareholders and customers; however, in some situations, they cause considerable cynicism among employees who are internal stakeholders, which in turn can weaken the effectiveness of CSR [56].

Employees frequently perceive fairness through wage comparisons, using CEO and TMT compensations as a reference [57,58]. Wage comparison among members of an organization influences identification and motivation through social identity by evaluating the adequacy of social exchange relationships [58,59]. According to social exchange theory, action of employee is related to the reaction of the management through reciprocity [57]. When a CEO in the organization fails to maintain a balance by not fulfilling their obligations, a breach of psychological contract occurs, which can result in negative attitudes such as job dissatisfaction, turnover intention, and negative behaviors [59]. The manager-employee pay multiple refers to the difference in the level of compensation between each organizational level. This implies that compensation is efficiently distributed based on managers' and employees' contribution to value creation in the company. When the imbalance in wage distribution creates a perception of inequality, a trust gap occurs between the CEO and employees [60]. This gap reduces employee commitment, cooperation, and

information-sharing fostered by the CEO, resulting in a negative impact on organizational performance [61]. In addition, an excessive wage gap between management and employees reduces mutual trust, as members of the same organization perceive that limited resources are exploitatively distributed [61,62]. The perception of unfair wage distribution decreases the attachment to the organization of the internal stakeholders of CSR and weakens trust, cohesion, and cooperation among members [63–66]. Thus, it is expected that less average wage gap between CEO and employees may provide more potential benefits to firms which pursue CSR by strengthening trust and cohesion within organizations. Put differently, a high average wage gap between CEO and employees weakens the positive interaction between CSR and innovation activities. Therefore, we formulated the following hypothesis:

Hypothesis 5. *The positive relationship between CSR and innovation activities is weaker when there is a high wage gap between CEO and employees.*

3. Research Method

3.1. Sample Selection and Data Collection

For an empirical analysis of the relationship between CSR and innovation, we selected companies continuously listed on the Korea Stock Exchange for five years from 2014 to 2018. Selection was limited to corporations with December settlement of accounts. To ensure sample homogeneity, we excluded the financial industry because of the difficulty in calculating R&D costs given the difference in the industry's use of an account classification system. Of note, the Financial Investment Services and Capital Markets Act in Korea was amended, and the study's sample period is from fiscal 2014 to fiscal 2018, where information on compensation of managers and individual executives of listed companies can be obtained [67]. From 2013, compensation details of executives earning 500 million won or more, in addition to comprehensive calculation criteria and methods, must be disclosed, by presidential decree, in accordance with the revision of the Capital Market Act [67].

The research sample for this study included companies for which data on CEO compensation, Environmental, Social and Governance (ESG) evaluation data, and other financial information were collected. Accordingly, the final sample was composed of panel data of 2936 CEO-year observations, after samples with missing information were excluded from the initial 3590 cases (five years of data for 718 companies).

In this study, the annual ESG evaluation score determined by the Korea Corporate Governance Service (KCGS) for listed domestic companies was used as a proxy for CSR activity level. The KCGS's ESG evaluation score comprehensively measures the level of CSR activity for each company [34]. In this study, the evaluation scores for the social responsibility (S) and environmental (E) management evaluation sections were used as proxy variables for CSR activities. Thus, the overall score consisted of five sub-evaluation areas. The score for each section had a maximum of 300 points.

Information on CEO compensation was sourced from the business report provided by the Financial Supervisory Service's Data Analysis of the Retrieval and Transfer (DART) system and the TS 2000 database of the Korea Listed Companies Association. Data on CEO compensation (total, cash, and stock) were gathered for companies obliged to disclose compensation details for individual registered executives in accordance with revisions to the Capital Market Act at the end of 2013. Data on employee wages and compensation and holdings of TMT members were collected from business reports provided by the Financial Supervisory Service's DART system.

Corporate innovation activities were identified from company business reports, the FnGuide, and the KIS-Value database. Lastly, information on patents was collected through the electronic patent acquisition system of the Financial Supervisory Service and the Korea Intellectual Property Rights Information Service, a comprehensive patent information service with a database of industrial property rights.

3.2. Variable Description and Measurement

The main variables and research models used in the empirical analysis are described in this section. A summary of the main variables is provided in Table 1.

Table 1. Definition of main variables.

Variable Name	Variable Definition
CSR	The evaluation score of the Korea Corporate Governance Service, where E and S represent scores in the environmental and social responsibility management sectors, respectively, ES is the sum of the scores in the environmental and social responsibility management sectors. Sub-domains of the social responsibility evaluation section include S1, S2, S3, and S4, the evaluation scores for workers, suppliers and competitors, consumers, and communities, respectively.
R&D expenditure	Ratio of R&D expenditure to total sales [t + 1]
number of patents	Number of patents in the company [t + 1]
CEO-incentive	The natural logarithm of performance pay/CEO total compensation
CEO-Stock Performance	The natural logarithm of the ratio of stock performance pay to CEO pay-for-performance compensation
CEO-TMT wage gap	The natural logarithm of CEO total reward/TMT average reward
CEO-Employee wage gap	The natural logarithm of CEO total compensation/employee average compensation
CEO tenure	Year of CEO tenure (t)
business year	Years of company operation (t)
debt ratio	The company's debt ratio in the year (total liabilities/total assets) (t)
foreign	Foreign ownership rate
size	Firm size: the natural logarithm of the number of employees
Owner-manager	Owner-manager status = 1 if the CEO is the largest shareholder; 0 otherwise
CEO share	The natural logarithm of CEO stake
year/industry dummy	Industrial dummy changes according to the Korean standard industrial middle classification

3.3. Research Model

In this study, we conducted panel data analyses. Panel data models provide information on individual firm (or CEO) behavior, both across individual firms and over time. The data and models have both cross-sectional and time-series dimensions. The panel data we used were unbalanced when firms were not observed in all time periods. As endogeneity may arise when estimating such a panel regression model, the Hausman test was performed to detect endogeneity between these explanatory variables and individual effects. Hausman test results can identify whether the models are random-effect or fixed-effect models. If the null hypothesis cannot be rejected, there is no explanatory variable or endogeneity problem. If the null hypothesis is rejected, it should be estimated using a fixed-effect model. In addition, we conducted normality tests such as Shapiro-Wilk normality tests, indicating normal distribution of data. For instance, the following is the empirical specification model 2 of Table 2 used in this study.

Table 2. Descriptive statistics and correlation analysis.

	Mean	S.D	1	2	3	4	5	6	7	8	9	10	11	12	13
1. R&D expenditure	0.11	0.04													
2. Patent right	18.9	135.3	0.24 ***												
3. CSR score	5.44	1.07	0.15 ***	0.36 ***											
4. CEO performance pay ratio	0.55	0.47	0.07 ***	0.18 ***	0.26 ***										
5. CEO share payout ratio	0.45	0.46	0.10 ***	0.08 ***	0.14 ***	0.11 ***									
6. CEO-TMT wage gap	3.94	1.94	0.06 **	0.01	−0.01	0.05 **	0.05 **								
7. CEO-Employee wage gap	43.4	9.97	0.10	0.09 ***	0.12 **	0.31 ***	0.02	0.16 ***							
8. Number of years of service	15.64	14.06	−0.010	−0.05 **	−0.18 ***	0.01	−0.02	0.03 *	−0.01						
9. Company size	1620.3	5803.5	0.05 **	−0.08 ***	−0.04 *	0.09 ***	0.06 **	0.02	0.03 *	0.22 ***					
10. Corporate year	39.79	19.43	−0.03	−0.03 *	−0.03	−0.03 *	−0.05 **	−0.02	−0.05 **	0.07 ***	0.05 **				
11. Debt ratio	122.55	404.09	0.02	0.04 *	0.04 *	−0.01	−0.05 **	0.01	0.01	−0.07 **	0.03	−0.05 **			
12. Foreign Investment ratio	10.36	13.25	0.11 ***	0.26 ***	0.37 ***	0.27 ***	0.18 ***	0.03 *	0.12 ***	−0.02 *	−0.04 **	−0.05 **	−0.07 **		
13. owner-manager	0.47	0.50	−0.09 ***	0.006	−0.11 ***	0.07 ***	−0.002	0.003	0.05 *	0.40 ***	0.05 **	0.09 ***	−0.03	−0.03	
14. CEO stake	0.7	11.2	−0.05 **	−0.03	−0.02	0.03	0.03	−0.003	−0.08 **	0.06 **	−0.004	0.01	−0.01	−0.02	0.05 **

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$. Note: * CSR score: converted to ESG evaluation score (A+: 10, A: 9, A−: 8, B+: 7, B: 6, B: 5); * R&D expenditure (KRW): R&D expenditure total expenditure/revenue; * CEO incentive pay (KRW): CEO performance bonus/CEO total compensation; * CEO stock performance bonus: CEO stock performance bonus/CEO total compensation; * CEO-TMT wage gap: CEO total compensation/TMT average compensation; * CEO-employee wage gap: CEO total compensation/employee average compensation; * Company size: number of employees; * CEO ownership ratio: stake owned by management; * Owner presence: dummy variable of 1 if owner; 0 otherwise.

$$ln[R\&D\ it + 1] = \beta_0 + \beta_1\ CSR\ it + \beta_2\ CEO\ performance\ pay\ ratio\ it + \beta_3\ (CSR * CEO\ performance\ pay\ ratio)\ it + \beta_4\ (Controls)\ it + \varepsilon it \quad (1)$$

4. Results

Table 2 presents the descriptive statistics and correlations for variables in the study. Tables 3 and 4 present the results of the panel regression model; Table 3 shows the results of effect of the explanatory variables on R&D expenditure. In Model 1, the CSR score had a significant positive effect ($\beta = 0.26$, $p < 0.01$) on the level of R&D expenditure. The coefficient of CSR on patent rights in Model 1 of Table 4 was also significantly positive. Therefore, Hypothesis 1 is supported, indicating that the higher the level of CSR activities of a company, the higher the innovation activities.

Hypotheses 2, 3, 4 and 5 predict the interaction effects of CSR and different components of CEO compensation system on innovative activities. First, we investigated the interaction between CSR and the proportion of performance-based pay to total compensation. As shown in Model 2 of Table 3, the interaction effect of CSR score and CEO performance pay was statistically significant and positive ($\beta = 0.72$, $p < 0.01$). Likewise, when patent rights were used as dependent variables, the coefficient value of interaction term was positive, as shown in Model 2 of Table 4. The results indicate that CSR combined with the high proportion of performance-based pay to total compensation can increase innovation activities, which supports Hypothesis 2.

Moreover, in Model 3, the coefficient value of the interaction term between CSR score and the proportion of CEO stock-based pay to total performance-based pay was significantly positive ($\beta = 1.77$, $p < 0.01$). Although the main effect of CEO stock-based pay was negative, the predicted interactive effect of CSR on innovation was still positive by offsetting the main effect, indicating that there is a positive effect of CSR and the intensity of CEO stock-based incentive on R&D expenditure. However, the interactive effect of CSR and the proportion of stock-based pay to total performance-based compensation on patent rights presented in Model 3 of Table 4 is not statistically significant. Thus, there is limited evidence supporting the alignment between CSR and the intensity of stock-based pay predicted by Hypothesis 3.

Table 3. CSR, innovation activities (R&D expenditure) and CEO compensation.

	Model 1	Model 2	Model 3	Model 4	Model 5
Tenure	0.47 *	0.49 *	0.47 *	0.91 **	0.45 **
Corporate year	0.87 **	0.95 **	0.91 **	0.04	0.83
Debt ratio	−0.001	−0.001	−0.002	−0.001	−0.001
Foreign Investment Ratio	0.09 ***	0.06 **	0.06 **	0.09 **	0.07 **
Company size	0.31 **	0.25 **	0.30 **	0.24 **	0.32 ***
Owner-manager	−2.75 ***	−2.72 ***	−2.81 ***	−2.32 **	−2.74 ***
CEO share	−0.33 **	−0.236 **	−0.37 **	0.01	−0.34 **
Year fixed effect	Yes	Yes	Yes	Yes	Yes
Industry fixed effect	Yes	Yes	Yes	Yes	Yes
CSR score	0.26 ***	0.29 *	0.31 *	0.13 ***	0.27 **
Performance pay		−0.12 **			
CSR * performance pay		0.72 **			
CEO stock-based pay ratio			−1.17 **		
CSR * stock-based pay ratio			1.77 **		
CEO-TMT wage gap				0.04	
CSR * TMT wage gap				−0.002	
CEO-employee wage gap					−0.23 **
CSR * CEO-employee wage gap					−1.13 **
Adjusted R^2	0.05	0.06	0.05	0.04	0.09
F value	11.25	10.35	10.25	10.60	12.39
Number of observations	1732	1731	1732	1732	1733

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

Table 4. CSR, innovation activities (patent rights) and CEO compensation.

	Model 1	Model 2	Model 3	Model 4	Model 5
Tenure	0.01	0.02	0.02	−0.07	−0.01
Corporate year	−0.05	−0.04	−0.05	0.12 *	−0.03
Debt ratio	0.001 *	0.002 *	0.002 *	0.002	0.002 **
Foreign Investment Ratio	0.02 ***	0.01 ***	0.02 ***	0.03 ***	0.03 ***
Company size	0.02 **	0.03 **	0.02	0.03 **	0.03 ***
Owner-manager	0.05	0.06	0.06	−0.05	0.09
CEO share	−0.06 ***	−0.06 ***	−0.05 ***	−0.002	−0.003
Year	Yes	Yes	Yes	Yes	Yes
Industrial dummy	Yes	Yes	Yes	Yes	Yes
CSR score	0.21 ***	0.16 ***	0.24 ***	0.14 ***	0.17 ***
Performance-based pay ratio		−0.14 ***			
CSR * performance pay ratio		0.09 ***			
CEO stock performance pay ratio			0.15		
CSR * stock performance			0.09		
CEO-TMT wage gap				−0.50 **	
CSR * TMT wage gap				−0.32 **	
CEO-employee wage gap					−0.33 **
CSR * CEO-employee wage gap					−0.20 **
Adjusted R^2	0.13	0.14	0.13	0.21	0.14
F value	30.02	25.17	24.17	17.14	25.62
Number of observations	1489	1488	1489	602	1489

* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

Third, Hypothesis 4 proposes the interactive relationship between CSR and TMT pay differentials. As shown in Model 4 of Table 3, the regression coefficient was not statistically significant. However, the coefficient value of interaction term between CSR and pay differential on patent acquisition presented in Model 4 of Table 4 was significantly negative ($\beta = -0.32$, $p < 0.01$). The results indicate limited evidence supporting the positive synergistic effect between CSR and TMT horizontal pay equity.

Finally, the potential interactive relationship between CSR and CEO-employee wage gap was strongly supported as predicted by Hypothesis 5, suggesting a good match between CSR and low CEO-employee wage gap. The regression coefficient of the interaction term of CSR and the CEO-employee wage gap was negative ($\beta = -1.13$, $p < 0.01$), as shown in model 5 of Table 4. It also confirms the interaction effect of CSR and wage gap on patent rights.

5. Discussion and Conclusions

Our first purpose in this study was to examine the impact of CSR initiatives on innovation activities. Hypothesis 1 predicted the positive effect of CSR on innovation. Based on the panel data of 718 publicly traded Korean firms and on archival financial and patent data for five years, we found strong evidence of the significant impact of CSR on innovation activities measured by R&D expenditure and patent rights acquisition. The results suggested that the more that companies engage in CSR activities, the more they conduct diverse social contribution activities utilizing the company's core competencies [68]. This is consistent with recent findings by Zhou et al. [69], suggesting CSR had a positive effect on service and product innovation of manufacturing companies in China. Similarly, a recent study conducted using multi-national sample suggested that the impact of CSR on corporate innovation is more pronounced in developed countries including Korea [70]. Likewise, these CSR-oriented corporate innovation activities fulfill environmental and social goals by offering innovative products and services and building corporate value. Thus, CSR activities can be the most important drivers of corporate innovation and play an important role in stimulating new product innovation [4].

Our primary objective was to understand how CEO compensation system affects CSR's impact on corporate innovation activities. First, findings indicated that the greater the proportion of performance-based pay to total compensation, the stronger the positive relationships between CSR and innovation activities, which supports Hypothesis 2. We may predict an increase in R&D investments of a company with a rise in the CEO's performance-based compensation. In other words, more compensation is provided to managers to incentivize investment in R&D. CSR and innovation activities may be regarded as decision-makers who take strategic decisions on behalf of shareholders [71].

Furthermore, we predicted that stock-based portion in the CEO performance-based compensation mix can strengthen the positive relationship between CSR and innovation activities. However, there is limited evidence supporting the potential alignment between CSR and the intensity of stock-based pay predicted by Hypothesis 3. The results may imply that compensation schemes based on stock price performance are long-term rewards that may motivate managers to look beyond the short-term perspective and make long-term decisions [72–74], which can align with the value of CSR, thereby leading to innovation activities. The results confirm this argument when patent was used as a dependent variable. This is partially consistent with the prior study, arguing that long-term portion of CEO compensation had a positive and significant effect on corporate CSR participation [75]. However, we do not find strong evidence supporting this relationship.

Additionally, our final goal was to explore how the distribution of CEO compensation affects the CSR-innovation relationship. Hypothesis 4 predicted that the CEO-TMT wage gap weakened the positive impact of CSR on innovation activities, such as R&D expenditure and patent acquisition, because a large wage gap within the TMT may be detrimental to achieving organizational objectives in organizations wherein cooperation and collaboration are important [76,77]. We found limited evidence supporting the positive synergistic effect between CSR and TMT horizontal pay equity. Finally, we predicted the potential interactive effect of CSR and CEO-employee wage gap on innovation activities. The rationale behind this is that the wider wage gap between CEOs and employees can attenuate the positive impact of CSR on innovation activities. According to the social exchange perspective, information-sharing and commitment for internal stakeholders can be weakened, resulting in a negative impact on innovation [61,66,78]. We found strong evidence of an interactive relationship between CSR and CEO-employee wage gap, implying a good match between CSR and low CEO-employee wage gap.

Based on these results, this study makes the following contribution. First, the prior study on the effects of CSR on innovation has been characterized by mixed findings. Several studies call for the needs to extend CSR-innovation link [16,17,21]. This empirical inconsistency on the effects of CRS indicate that firms differ widely in their ability to manage the impact of CSR in firms pursue innovation strategies. However, few studies have directly considered how such relationship may be changed. Thus, we explored the possibility that CEO incentives can moderate the effect of the CSR-innovation relationship. Our findings indicate that CEO compensation is one of significant variables in understanding the CSR-innovation link and a varying component in the CEO compensation system plays differential roles in affecting the relationship. Our findings are consistent with prior research in that the CEO ultimately decides whether or not to engage in CSR activities and is incentivized to actively conduct CSR [34,36,79]. The decision made by CEOs to participate in CSR is an important factor in CSR activity performance [80]. Based on our findings, the higher the CEO's performance and stock-based pay, the higher the likelihood that the CEO will make an active decision regarding long-term strategic initiatives including CSR and innovation. Therefore, this study confirmed that the compensation structure for CEOs should be designed to drive long-term and risk-taking induced management performance [67,71].

Furthermore, our findings suggested how the equity perspective and social exchange relationship from internal stakeholders or employees operate in the context of CSR-innovation relationship. Our results indicated that pay equity within and between hierar-

chies create a detrimental work environment because of the high degree of equity concern and the breach of social exchange in organizations. Specifically, the wage gap between the CEO and the TMT may be detrimental to achieving organizational activities—such as CSR and innovation—for which cooperation and collaboration are important [76,77]. Our study concluded that widening this horizontal wage gap impedes collaboration and negatively affects organizational performance [38,81]. In addition, it is necessary for corporate management to examine how employees view CSR activities, and how this perception can have a positive effect on the organization's CSR activities [82]. However, when employees perceive inequity due to differences in compensation, the cooperation, information-sharing, and commitment to the business would decrease, negatively impacting innovation activities [61]. To ensure the success of CSR initiatives, companies must, therefore, reduce the perception of unfairness in wages, build employee trust for the CEO, and develop a positive perception of organizational CSR among employees, who are the internal stakeholders.

In conclusion, this research contributes important insights to the CSR-innovation literature from the strategic human resource management perspective. Specifically, we observed that the design in executive compensation is critical that aligns the core values embedded in the CSR and innovation activities. In addition, employees' perception of equity and social exchange play a key role in affecting CSR-innovation link. This study is a first step in linking HR variables to CSR-innovation strategic management. Moreover, these findings contribute practically to our understanding of managing executive compensation. The findings can help the firms to make strategic compensation design, which can magnify the CSR-innovation relationship.

This study also has limitations that suggest the needs for further study and refinements. First, this research mainly used publicly available archival sources by estimating the economy-wide average effect of CSR on innovation and did not directly test the underlying mechanism through which employees' equity perception and social identity through compensation system can play important roles in influencing CSR on innovation. Some improvements can be made in future studies by using case analysis and perceptual employee perceptual survey to convey a more comprehensive understanding of the relationship. Secondly, future research can extend to taking a long-term oriented innovation measurement to examine its long-term effect of CSR on innovation. Additionally, a multi-level method to relate CSR initiatives to employee innovative behaviors and attitudes. Moreover, researchers need to investigate the impact of compensation practices on the process of social exchange. Finally, future avenues of research may investigate the long-term effect of CSR, elucidating the link between CSR and innovation activities, and the theoretical links between CEO compensation and corporate strategy can provide more meaningful results and implications. These are just a few examples that researchers attempt to answer for the CSR and innovation relationships.

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The Influencing Mechanism of Internal Control Effectiveness on Technological Innovation: CSR as a Mediator

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Abstract: The study explores the relationship between internal control effectiveness, corporate social responsibility (CSR), and technological innovation. By establishing a mediating effect model, we analyzed the effect of internal control effectiveness on technological innovation. The study selected the data of Chinese A-share listed companies between 2014 and 2019 as the sample. The sources of variable indicators include China Stock Market and Accounting Research (CSMAR), DIB Internal Control database, and Hexun CSR score. The empirical study shows that internal control effectiveness is significantly and positively related to technological innovation. Enhancing internal control effectiveness has a significant positive effect on the fulfillment of corporate social responsibility. In the process of internal control effectiveness on technological innovation, corporate social responsibility functions as a mediating variable and plays a partial mediating role. The study provides empirical data to support listed companies' emphasis on internal control and active fulfillment of social responsibility, thereby enhancing their technological innovation performance.

Keywords: internal control; technological innovation; corporate social responsibility; mediated effect

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1. Introduction

The topic of enterprises' technological innovation has been attracting much attention from both academic and practical areas. With the introduction of a series of innovation-related policies, Chinese industrial development is being transformed and upgraded from the traditional manufacturing mode to the advanced creation mode, putting forward higher requirements on the enterprises' technological innovation. According to the 2021 Global Start-Up Ecosystem Report (GSER) by Startup Genome, North America continually dominates the global rankings, with 50% of the top 30 ecosystems from the region, followed by Asia (27%). The Chinese entrepreneurial ecosystem is dominant in terms of knowledge, and the technological innovation of Chinese enterprises has substantial research value. At the same time, there are significant differences in the degree of technological innovation within Chinese firms, which is an excellent research sample. This study selects Chinese listed companies in order to explore the drivers of technological innovation, which is the key to enhancing firm competitiveness.

As technological innovation is a high-risk and high-investment activity, innovation requires enterprises to have a high-intensity risk-taking capacity [1], influenced by internal and external factors. As an essential internal institutional arrangement, internal control is one of the means for enterprises to improve governance and control management risks [2]. Relevant policies monitor internal controls of listed companies, but to a greater extent, the specific details and degree of implementation are determined by the company itself. Reference [3] studied the inhibitory effect of corporate governance and internal control on inefficient investment. Internal control can regulate the review of innovation projects and the use of funds through institutional design. Internal control can also reduce

corporate surplus noise, reduce financing constraints, and promote the growth of R&D investment [4]. Some scholars have also made studies on the impact of corporate policy-making and implementation on technological innovation from the perspective of the external environment, such as policy environment [5], financial markets [6], competitive product markets [7], and risk support [8]. Nevertheless, the findings of such studies are too scattered and challenging for policymakers to synthesize and integrate into business decisions. The inclusion of corporate social responsibility as a comprehensive indicator can solve this problem to some extent.

Corporate social responsibility has been gradually proposed alongside economic transformation, emphasizing that companies should not neglect their shareholders, employees, customers and suppliers, the environment, and social responsibility while making profits. Corporate Social Responsibility is a means to improve corporate performance, enhance social credibility, maintain sustainable development, and generate intangible assets such as innovation, human capital, reputation, and culture [9], which confirms the importance and urgency of effective corporate social responsibility fulfillment.

At the same time, corporate social responsibility fulfillment has gradually become one of the essential factors for investors to consider corporate risk. Enterprises with a higher quality of internal control usually use voluntary social responsibility disclosure as a strategic tool to win investors' goodwill [10]. Reference [11] pointed out that enterprises with a higher awareness of social responsibility can focus on long-term corporate strategies, improve managers' short-sighted behavior, tolerate employees' innovative failure behavior, and improve employees' sense of job security, thus exerting a positive effect on technological innovation. Some other studies have focused on the direct impact of internal control effectiveness on corporate technological innovation [12–15].

Since internal control, as an institutional arrangement of enterprises, can effectively monitor the implementation of strategic management, and corporate social responsibility fulfillment is an essential component of strategic management objectives. Therefore, internal control effectiveness may act on technological innovation through the mediating effect of social responsibility. Studies have not examined the mediating role of corporate social responsibility, failing to open the "black box" of the mechanism of internal control effectiveness on technological innovation.

Hence, this study aims to identify the interaction mechanism between internal control effectiveness and technological innovation. A conceptual framework of "internal control effectiveness-corporate social responsibility-technological innovation" was developed and empirically examined. The study selected the data of Chinese A-share listed companies between 2014 and 2019 as the sample. The indicators of the research variables were obtained from authoritative Chinese databases, CSMAR, DIB database, and Hexun CSR score. It is hoped to provide theoretical support for companies to pay more attention to internal control and corporate social responsibility and ultimately improve technological innovation.

The remainder of the paper is structured as follows. Section 2 is the literature review and hypotheses development, which focuses on the relationship between internal control effectiveness, corporate social responsibility, and technological innovation from a theoretical perspective. Section 3 is the research design, introducing the sample source, variable definition, and model construction. Section 4 is the empirical analysis results. Section 5 concludes the paper and provides recommendations.

2. Literature Review and Hypotheses Development

2.1. The Relationship between Internal Control Effectiveness and Technological Innovation

Internal control is the process of the internal management system of an enterprise, which is implemented by the board of directors, supervisory board, managerial level, and all employees to achieve the control objectives. The effectiveness of internal control refers to the extent to which the established and implemented internal control effectively achieves the enterprise's internal control objectives, including two meanings. One is the match

of realization; the establishment of the internal control system should be consistent with the internal control objectives of the enterprise. The second is the efficiency of realization. Internal control should be operated through the control environment, risk assessment, information and communication, supervision and motivation, and other management activities, and ultimately the effective performance of internal control function to achieve the internal control objectives while providing good protection for stakeholders [6,16].

Reference [17] argued that technological innovation should contain two levels of connotation: innovation process and innovation output. The former refers to productive or disruptive behaviors that generate creative value in the market and real-world environment. The latter refers to the development of new markets, the renewal of new products, and the realization of new technologies. Innovation performance is the economic benefits generated by the commercialization of enterprises' technological innovation, which can reflect the ability and effectiveness of technological innovation in a comprehensive perspective [18]. High risk is the primary factor that hinders the achievement of technological innovation, and preventing controllable risks in the innovation process can effectively promote corporate technological innovation since high-quality internal control can control the risk of technological innovation in terms of risk assessment, strategic management, and business processes. Internal control can guarantee the rationality of resource input use and further enhance innovation efficiency. Therefore, effective internal control can positively influence technological innovation.

First, the direct action of enterprises to carry out technological innovation is to objectively assess the risk of project investment, consistency of objectives, size, and source of funds. The strict implementation of the internal control system can scientifically assess project investment risks, avoid non-efficient investments, and adequately authorize the approval of R&D funds [12].

Second, managers and shareholders in the separation of ownership and management model may disagree on technological innovation goals from different positions, which is highly prone to agency conflicts. Managers may prefer low-risk and low-return projects for self-interest, resulting in insufficient technological innovation for the enterprise. However, shareholders will not easily give up high-risk but shareholder-friendly projects for long-term interests. One of the requirements of the internal control setup is to strengthen the internal supervision of managers. Due to agency problems, selecting projects through strategic management, decision-making mechanisms, and risk assessment avoids underinvestment [13].

In addition, high-quality internal control requires enhanced information and communication so that strategic objectives and risk thresholds for technological innovation are clearly understood among all levels within the company. External investors and creditors can also effectively evaluate the company's development opportunities, profitability, and investment risks through high-level financial reports, thus improving investment efficiency and promoting technological innovation.

Regarding the positive contribution of internal control to technological innovation, scholars have confirmed this effect through empirical studies of Chinese firms. In an empirical study based on Chinese listed companies, Reference [3] showed that high-quality internal control can enhance the accuracy of information communication, balance managers' power, and efficiently arrange the innovation process and effectively improve the efficiency of investment. Reference [14] pointed out through empirical evidence that internal control can significantly inhibit the underinvestment of R&D subsidies in enterprises, because the achievement of innovation performance is closely related to R&D investment, which can indirectly confirm that internal control can positively affect technological innovation. Reference [15] explored the differences in the effect of internal control on innovation performance from the perspective of the nature of property rights, and found that the facilitating effect of internal control is more potent in non-state-owned enterprises. Internal controls promote corporate innovation by improving the quality of financial reporting [19],

reducing information asymmetry [20], and reducing the cost of capital [21]. Accordingly, we predicted the following:

Hypothesis 1. *Internal control effectiveness positively affects technological innovation.*

2.2. The Relationship between Internal Control Effectiveness and Corporate Social Responsibility

Corporate social responsibility refers to the responsibility that a company should fulfill to its stakeholders (including shareholders, customers, employees, government, etc.) [19]. Based on signal transmission theory, CSR, as a transmission signal of good corporate behavior, expresses to the outside world that the company values its stakeholders, which will cause stakeholders to support and recognize the company, thus helping the enterprise to gain a reputational advantage in the market [20]. The function performed by internal control in social responsibility is closely related to the appropriateness of strategic decisions and the effectiveness of fulfillment. The appropriateness of strategic decisions depends on investing resources in social responsibility, while the accurate implementation of social responsibility determines the effectiveness. The existing literature shows that as internal control extends, it contributes to corporate social responsibility decision making and implementation. Reference [22] proposed a strategic corporate social responsibility view. Reference [23] examined the value of corporate social responsibility as a strategic competitive tool under environmental and economic policy uncertainty. Reference [24] pointed out that corporate social responsibility resource input has a specific strategic nature. The internal control mechanism plays a crucial role in ensuring the rationality of corporate social responsibility decisions, which further enhances CSR's value-creation function and long-term fulfillment motivation. Reference [25] argued that an efficient internal control system could identify the risks in social responsibility implementation in advance. Building an effective information feedback platform and adjustment mechanism could balance the costs and benefits of social responsibility fulfillment and promote excellent fulfillment of social responsibility.

In the strategic decision-making aspect of social responsibility, internal control plays a role in two aspects. First, internal control can guarantee the appropriateness of social responsibility decisions, which are often incorporated into strategic management due to the disguised benefits they bring. The design of decision-making mechanisms, risk assessment, and other systems can determine the motivation and level of effort to fulfill social responsibility and reduce managers' opportunism and adverse selection behavior through balancing the managers' authority [26].

Second, internal control can optimize the efficiency of social responsibility resources input. Reference [27] confirmed that internal control could effectively avoid inefficient investment and further improve the efficiency of resource input. Reference [28] found that high-quality internal control can effectively suppress the negative effects of over-concentration of suppliers, which improves the enterprise's overall efficiency. Coordinating the balance of corporate resources in daily operations and social responsibility is a critical decision in strategic corporate management. Internal control rationalizes the resource allocation for social responsibility through goal setting, budget management, and benefits analysis, thus effectively performing the strategic function of social responsibility.

Based on rational decision making in terms of social responsibility, rational control of risks and costs in the process of social responsibility fulfillment is the key to guaranteeing the accurate fulfillment of social responsibility. Internal control plays a specific guarantee-function for implementing social responsibility through risk management and system regulation. The internal control application guidelines promulgated by China Securities Regulatory Commission (CSRC) have made mandatory provisions on the scope of corporate social responsibility to be undertaken. Enhancing quality and safety, and investing in environmental protection, inevitably increase the cost of fulfilling these social responsibilities. Effective internal control can optimize fulfillment content to minimize the cost [6]. In addition, for the critical risk points in the implementation of social responsibility,

internal control can regulate the implementation process from the institutional level and strengthen compliance with the disclosure process and rules to mitigate the risks in the implementation process [29]. Accordingly, we predicted the following:

Hypothesis 2. *Internal control effectiveness positively affects corporate social responsibility.*

2.3. The Relationship between Internal Control Effectiveness, Corporate Social Responsibility, and Technological Innovation

In a high-quality internal control environment, the company's internal control system and operational management are more standardized. The investment risk, project operation risk, and marketability risk in technological innovation can be further controlled [30]. In the process of strengthening the internal control environment, the management of business-level activities such as capital investment, R&D design, and process approval in the implementation of innovation are also more standardized [31]. An effective internal control environment controls the innovation process risks and improves the efficiency of innovation inputs. Strategic management under high-quality internal control also brings higher innovation aspirations [32], and companies are more willing to include continuous innovation in their strategic management. Firms are increasingly aware that only by strengthening technological innovation can they win core competitiveness and maintain sustainable development under fierce market competition, promoting technological innovation.

A high-quality internal control environment strategically strengthens the corporate social responsibility commitment to their stakeholders, including the trust and rewards that firms give to investors, and the incentives and rewards given to employees [33]. According to stakeholder theory, by closely aligning innovation objectives with social responsibility, as well as the excellent information and objective evaluation of their own risks presented in information disclosure on a regular and voluntary basis, enterprises can obtain resource supply from investors and policy benefits or policy subsidies from the government for technological innovation. This approach reduces the cost and risk in the innovation process.

In addition, fulfilling social responsibility to employees by providing care and increasing incentives to R&D staff can enhance the level of employees' positive efforts in the innovation process and increase the probability of innovation success [34]. In the context of a high level of internal control, social responsibility could be seen as a commitment to implement social responsibility and a means to reduce innovation costs and risks, thus increasing innovation's success possibility. The fulfillment of corporate social responsibility is an essential guarantee for achieving the goal of sustainable development [35]. Accordingly, we predicted the following:

Hypothesis 3. *Corporate social responsibility mediates the effect of internal control effectiveness on technological innovation.*

3. Research Methodology

3.1. Sample Selection and Data Sources

This paper selects A-share listed companies from 2014–2019 as the research sample and screens the sample according to the following criteria:

1. Excluding financial listed companies; considering that financial companies have certain peculiarities in terms of business nature and financial indicators compared with other companies, putting them together may bias the results.
2. Excluding ST and * ST; according to the China Securities Regulatory Commission (CSRC), ST means special treatment, indicating that when a listed company loses money for two consecutive years or its net asset value is lower than the par value of the stock, the daily rise or fall of the stock shall not exceed 5%, in order to reduce the investment risk. If the company is still making a loss in the third year, the word '* ST' will be added in front of the stock name, which means the risk of delisting.

3. Excluding the samples with missing and abnormal data.

The final sample of 13,685 valid studies was obtained after screening and sorting. The selected companies come from 31 provinces in China, presented in Figure 1, spreading across all listed companies' industries. The sample covers all industries listed in Table 1, with the largest number of manufacturing industries. Table 2 shows the high number of non-state enterprises, indicating that the private economy plays a large role in the Chinese economy. The data were processed and summarized using Excel, and the data statistics and analysis were performed using Stata.

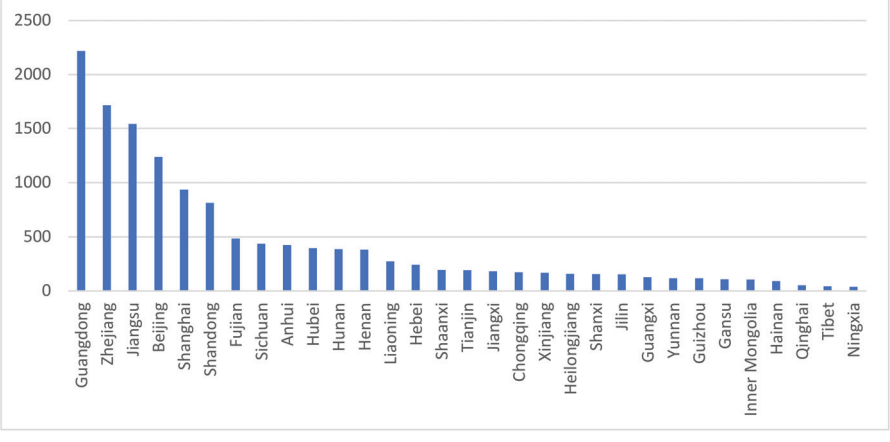

Figure 1. Regional distribution of listed companies in the sample.

Table 1. Industry distribution of listed companies in the sample.

Industry	2014	2015	2016	2017	2018	2019	Total
Mining	44	42	48	51	58	55	298
Electricity, heat, gas and water production and supply industry	31	36	46	42	56	71	282
Real estate industry	22	18	23	22	36	40	161
Construction industry	47	50	58	71	80	81	387
Transportation, warehousing and postal services industry	23	25	32	36	51	58	225
Education industry	4	4	3	4	7	7	29
Scientific research and technology service industry	16	20	26	30	43	47	182
Agriculture, forestry, animal husbandry and fishery industry	23	23	28	26	27	29	156
Wholesale and retail businesses industry	45	46	50	60	74	74	349
Management of water conservancy, environment and public facilities industry	19	22	26	25	34	37	163
Health and social work industry	4	5	8	8	9	5	39
Culture, sports and entertainment industry	16	19	25	28	34	37	159
Information transmission, software and information technology service industry	152	171	195	222	229	224	1193
Manufacturing industry	1295	1366	1542	1689	1946	1980	9818
Accommodation and catering industry	1	1	1	3	5	5	16
Synthesis industry	12	10	10	12	12	14	70
Leasing and business services industry	19	22	28	24	29	36	158
Total	1773	1880	2149	2353	2730	2800	

Source: Own study.

Table 2. List of the property right of sample listed companies.

Property Rights	2014	2015	2016	2017	2018	2019	Total
Non-state enterprise	1173	1269	1484	1665	1966	2378	9935
State-owned enterprises	600	611	665	688	764	422	3750
Total	1773	1880	2149	2353	2730	2800	13,685

Source: Own study.

3.2. Variable

The dependent variable is technological innovation (Innovation). According to previous empirical studies [12–14,18], indicators for measuring technological innovation are usually divided into two types. One is the technological innovation input indicator based on R&D investment and R&D employee numbers. The other is the technological innovation output indicator based on the patent application number and the percentage of new product business income. Considering that output indicators can more genuinely reflect the technological innovation performance and the innovation effectiveness, this study selected the number of patent applications as an innovation output indicator to measure the enterprises' technological innovation. The specific definitions and measures of each variable are shown in Table 3.

Table 3. Variable Definitions.

Type	Names	Symbols	Definition
Dependent variable	Technology Innovation	Innovation	Total number of patent applications for listed companies
Independent variable	Internal Control Effectiveness	ICI	DIB Internal Control Index/100
Mediator variable	Corporate Social Responsibility	CSR	Hexun CSR score of listed companies
Control variables	Company size	Size	Total assets of listed companies are taken as the logarithm
	Nature of property rights	State	State = 1 or 0, State-owned enterprises take 1
	R&D investment intensity	R&D	R&D expenditure/Main business income
	Asset-liability ratio	Lev	Total liabilities/Total assets
	Profitability	ROA	Net profit/Total assets
	Operating income growth rate	Growth	Amount of change in operating income for the period/Operating revenue for the previous period
	Company market value	Tobin's Q	Total market value/Asset replacement cost
	Cash flow sufficiency	Cash	Net cash flow from operations/Total assets
	Fixed Assets Ratio	PPE	Fixed Assets/Total Assets
	Concentration of shareholding	TOP10	Total shareholding of top ten shareholders
	Ratio of independent directors	Indiratio	Number of independent directors/All directors
	Year	Year	Year Dummy variables
	Industry	Ind	Industry dummy variables set according to CSRC standards

The independent variable is internal control effectiveness (ICI). The Internal Control Index is a large system of internal control indicators with numbers, which is a centralized visual reflection of the level of internal control and industry ranking of enterprises [36]. According to previous empirical studies [25,27,29], the measurement of internal control effectiveness focuses on two aspects. One is to compile listed companies' disclosed internal-control information and set indicators to be evaluated by scoring in dimensions, and the other is to adopt the internal control index issued by authoritative institutions. The current, highly recognized, Chinese internal control indicators are the indices issued by the Hanwen Chen team at Xiamen University [37] and DIB Business Risk Management

Inc. [38]. The former reflects the integrity and soundness of the internal control system of listed companies, while the latter reflects the effectiveness of the internal control operation process of listed companies. In this paper, we adopt the internal control index from the DIB database.

The DIB Internal Control Index is based on the relevant regulations on internal control in China and the evaluation index system designed by the China Securities Regulatory Commission on information disclosure and COSO framework, and the information disclosed in the annual report, internal control evaluation report and internal control audit report of each listed company is statistically scored. In this study, the research process is standardized by dividing the value by 100 as a measure of internal control effectiveness.

Mediating variable. We selected corporate social responsibility (CSR) as a mediator. The commonly used measurement methods in the existing literature include the weight index method and the third-party rating method [33,34,39,40]. Among the third-party ratings, Hexun CSR score comprehensively considers corporate social responsibility in five dimensions: shareholder (30%), employee (10% or 15%), customers, and suppliers (10% or 15%), environmental (10%, 20% or 30%) and social responsibility (10%, 20% or 30%), and the proportion of index scores in each part varies according to the industry [41]. Hexun CSR score involves all listed companies in China, which is a more comprehensive sample [42]. Therefore, this paper adopted the Hexun CSR score.

Control Variables. Considering that other factors may affect the results, this study selected some control variables. Company size (Size) may be related to scale effects and affects firm performance [43]. Property rights (State) reflects the ownership attribution of the firm and affects the firm's innovation decision [8]. R&D investment intensity (R&D) is measured by R&D expenses [44]. Asset-liability ratio (Lev) reflects the unsystematic risk [45]. Profitability (ROA) reflects the firm's overall profitability level and has an important correlation with innovation support [46]. Operating income growth rate (Growth) influences the firm's choice of investment projects, which in turn affects innovation. Company market value (Tobin's Q) indicates a firm's long-term performance [45]. Cash flow sufficiency (Cash) reflects a firm's cash flow and affects technological innovation inputs [47]. Fixed Assets Ratio (PPE) reflects the investment and operation of the firm's assets [48]. Concentration of shareholding (TOP 10) affects the agency problem, and its relationship with technological innovation has been widely noticed; we use the top ten shareholders' shareholding ratio [47]. Ratio of independent directors (Indiratio) belongs to the board of directors' characteristics, which reflects the corporate governance [9]. We also controlled Year and Industry (Ind) because of the multi-industry data between 2014 and 2019.

3.3. Models

This paper establishes the following three research models by referring to the mediation effect test method [49,50], combined with the research hypotheses. Model 1 examines the relationship between technological innovation and internal control effectiveness. Model 2 examines the effect of internal control effectiveness on corporate social responsibility. Model 3 examines the mediating effect of corporate social responsibility between technological innovation and internal control effectiveness.

$$\begin{aligned} Innovation_{i,t} &= \alpha_0 + \alpha_1 ICI_{i,t} + \alpha_2 Size_{i,t} + \alpha_3 State_{i,t} + \alpha_4 R\&D_{i,t} + \alpha_5 Lev_{i,t} + \alpha_6 ROA_{i,t} + \alpha_7 Growth_{i,t} \\ &+\alpha_8 TobinQ_{i,t} + \alpha_9 Cash_{i,t} + \alpha_{10} PPE_{i,t} + \alpha_{11} TOP10_{i,t} + \alpha_{12} Indiratio_{i,t} \\ &+ \sum Year + \sum Ind + \varepsilon_{i,t} \end{aligned} \quad (1)$$

$$\begin{aligned} CSR_{i,t} = \beta_0 + \beta_1 ICI_{i,t} + \beta_2 Size_{i,t} + \beta_3 State_{i,t} + \beta_4 R\&D_{i,t} + \beta_5 Lev_{i,t} + \beta_6 ROA_{i,t} + \beta_7 Growth_{i,t} + \beta_8 TobinQ_{i,t} \\ +\beta_9 Cash_{i,t} + \beta_{10} PPE_{i,t} + \beta_{11} TOP10_{i,t} + \beta_{12} Indiratio_{i,t} + \sum Year + \sum Ind + \varepsilon_{i,t} \end{aligned} \quad (2)$$

$$\begin{aligned} Innovation_{i,t} &= \gamma_0 + \gamma_1 ICI_{i,t} + \gamma_2 CSR_{i,t} + \gamma_3 Size_{i,t} + \gamma_4 State_{i,t} + \gamma_5 R\&D_{i,t} + \gamma_6 Lev_{i,t} + \gamma_7 ROA_{i,t} \\ &+\gamma_8 Growth_{i,t} + \gamma_9 TobinQ_{i,t} + \gamma_{10} Cash_{i,t} + \gamma_{11} PPE_{i,t} + \gamma_{12} TOP10_{i,t} + \gamma_{13} Indiratio_{i,t} \\ &+ \sum Yaer + \sum Ind + \varepsilon_{i,t} \end{aligned} \quad (3)$$

If the coefficient α_1 of the explanatory variable ICI in model 1 is significant and has a positive value, Hypothesis 1 is supported. If the coefficient β_1 of the explanatory variable ICI in model 2 is significant and has a positive value, Hypothesis 2 is supported. If both model 1 and model 2 pass, the study will test the coefficient γ_2 of the mediating variable CSR in model 3. If the coefficient γ_2 is not significant, the Sobel test needs to be taken. If the coefficient γ_2 is significant, we continue to observe the coefficient γ_1 of the explanatory variable ICI in model 3. If the coefficient γ_1 is insignificant, it indicates that CSR plays a fully mediating role in the effect of internal control effectiveness on technological innovation. If the coefficient γ_1 is significant with a positive value, and the coefficient γ_1 is less than the coefficient α_1, this means that CSR plays a partially mediating role in the effect of internal control on technological innovation.

4. Results

4.1. Descriptive Statistics

Table 4 demonstrates the results of descriptive statistics for each variable. Among the main variables, the mean and median of Innovation are 89.68 and 21.00, respectively, indicating that most samples fall on the right side and there is a right bias. The maximum and minimum values are 20,107.00 and 0.00, respectively, and the standard deviation is 486.86, which indicates a significant variation in the degree of technological innovation among listed companies.

Table 4. Descriptive Statistics of the main variables.

Variables	Max	Min	Mean	Median	Sd
Innovation	20107.00	0.00	89.68	21.00	486.86
ICI	9.41	0.00	6.32	6.62	1.40
CSR	87.99	0.01	22.29	21.18	12.03
Size	28.64	17.81	22.24	22.07	1.29
State	1.00	0.00	0.27	0.00	0.45
R&D	0.88	0.00	0.05	0.04	0.06
Lev	0.98	0.01	0.41	0.40	0.34
ROA	0.96	−2.34	0.05	0.04	0.07
Growth	96.02	−0.98	0.33	0.12	4.28
Tobin's Q	70.58	0.05	2.31	1.70	2.36
Cash	0.66	−1.94	0.05	0.05	0.07
PPE	0.88	0.00	0.21	0.18	0.15
TOP10	0.98	0.09	0.59	0.59	0.15
Indiratio	0.80	0.23	0.38	0.36	0.06

Source: Own study.

The mean and median of the internal control effectiveness (ICI) are 6.32 and 6.62, respectively. Both values are relatively close, indicating a relatively even overall distribution. The maximum value is 9.41, the minimum value is 0.00, and the standard deviation is 1.40, which shows that different listed companies attach different importance to internal control. There are disparities in the effectiveness of internal control in listed companies.

The mean and median of CSR are 22.29 and 21.18, respectively, which shows that Chinese listed companies' average degree of social responsibility fulfillment is high. The maximum value is 87.99, the minimum value is 0.01, and the standard deviation is 12.03, which shows that differently listed companies have apparent differences in responsibility undertaking and the fulfillment of social responsibility.

Among the control variables, the least dispersion of the sample is R&D and Indiratio, with a standard deviation of 0.06. The largest dispersion of the sample is Growth, with a standard deviation of 4.28, which indicates significant differences in the profitability and growth space of different listed companies.

4.2. Correlation Analysis

The results of the correlation analysis are shown in Table 5. ICI and Innovation are positively correlated at the 1% significance level with a correlation coefficient of 0.06, which is a preliminary indication that high-quality internal control can create a good infrastructure environment for technological innovation, and can promote technological innovation. ICI and CSR are significantly and positively correlated at the 1% level with a correlation coefficient of 0.22, indicating that effective internal control operation can support social responsibility decision making and implementation and enhance the fulfillment of corporate social responsibility.

The correlation coefficient between CSR and Innovation is significant and positive at a 1% level with 0.09, which means that enterprises can indirectly obtain innovation resources and policy preferences to promote technological innovation by actively undertaking and fulfilling their responsibilities to multi-stakeholders. In addition, the correlation coefficients among the variables are all below 0.5, indicating that there is no high correlation among the variables, which is reasonable.

4.3. Regression Analysis

According to Table 6, the regression result of model 1 shows that the coefficient of internal control effectiveness (ICI) on technological innovation (Innovation) is 0.0258 and is positively correlated at a 1% level of significance, indicating that the more effective the internal control of the enterprise, the better the performance of technological innovation. Hypothesis 1 is supported. Under the same conditions, the better the internal control system is constructed and the better the quality of internal control operation, the better the infrastructure environment for enterprises to carry out technological innovation, and the more abundant are the innovation results achieved. This conclusion verifies the necessity of internal control system construction. It can fully explain why technological innovation results are generally concentrated in large first-tier enterprises, group companies, and other enterprises which attach importance to internal control construction.

The regression results of model 2 show that the coefficient of internal control effectiveness (ICI) on corporate social responsibility (CSR) is 0.1521 and is significantly positively correlated at the 1% level. It indicates that enhancing internal control effectiveness can increase corporate technological innovation, and Hypothesis 2 is supported. Under controlling other variables, improving the enterprises' internal control system can make enterprises aware of the importance of social responsibility and actively undertake social responsibility.

Based on Hypothesis 1 and 2, the mediating effect of model 3 of corporate social responsibility was tested. The results show that the coefficient of the effect of CSR on technological innovation is 0.0223, which is significantly positive at the 5% level. The coefficient of the effect of internal control effectiveness (ICI) on technological innovation (Innovation) is 0.0224, which is significantly positive at the 1% level, and its coefficient of effect is smaller than the coefficient of the effect of internal control effectiveness on technological innovation without the mediating variable CSR in model 1. This fully indicates that CSR partially mediates internal control effectiveness on technological innovation, and Hypothesis 3 is supported. Internal control effectiveness can directly impact technological innovation and indirectly affect technological innovation through the mediating effect of CSR.

Table 5. Correlation coefficient test of main variables.

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Innovation	1													
2. Ici	0.06 ***	1												
3. CSR	0.09 ***	0.22 ***	1											
4. Size	0.28 ***	0.10 ***	0.18 ***	1										
5. State	0.07 ***	−0.02 **	0.06 ***	0.35 ***	1									
6. R&D	−0.01	−0.02 *	−0.05 ***	−0.24 ***	−0.16 ***	1								
7. Lev	0.08 ***	−0.12 ***	−0.07 ***	0.27 ***	0.14 ***	−0.07 ***	1							
8. ROA	0.00	0.30 ***	0.37 ***	−0.01	−0.09 ***	−0.10 ***	−0.46 ***	1						
9. Growth	−0.01	−0.03 ***	0.00	0.03 ***	0.00	−0.01	0.01 *	0.03 ***	1					
10. Tobin's Q	−0.07 ***	−0.02 ***	0.03 ***	−0.38 ***	−0.20 ***	0.30 ***	−0.17 ***	0.15 ***	0.01	1				
11. Cash	0.03 ***	0.13 ***	0.21 ***	0.07 ***	−0.01	−0.06 ***	−0.16 ***	0.39 ***	−0.01	−0.01	1			
12. PPE	−0.03 ***	−0.07 ***	−0.07 ***	0.12 ***	0.18 ***	−0.19 ***	0.05 ***	0.06 ***	−0.02 **	0.15 ***	0.22 ***	1		
13. TOP 10	0.08 **	0.13 ***	0.14 ***	0.13 ***	−0.01	−0.08 ***	−0.04 ***	0.19 ***	0.03 ***	0.04 ***	0.12 ***	0.01 *	1	
14. Indiratio	0.03 ***	0.01	−0.01	0.00	−0.05 ***	0.03 ***	−0.01	−0.01	0.00	0.05 ***	−0.01	0.04 ***	0.05 ***	1

Source: Own study. Note: ***, **, and * indicate significance at the 1, 5, and 10% levels, respectively.

Table 6. Regression analysis results.

Variables	Model 1 Innovation	Model 2 CSR	Model 3 Innovation
ICI	0.0258 ***	0.1521 ***	0.0224 ***
	(3.04)	(18.55)	(2.61)
CSR			0.0223 **
			(2.52)
Size	0.3266 ***	0.2193 ***	0.3217 ***
	(31.75)	(22.03)	(30.74)
State	−0.0216 **	0.0395 ***	−0.0225 **
	(−2.43)	(4.60)	(−2.53)
R&D	0.0427 ***	−0.0370 ***	0.0435 ***
	(4.88)	(−4.37)	(4.97)
Lev	0.0150 *	−0.0590 ***	0.0163 *
	(1.71)	(−7.64)	(1.86)
ROA	−0.0023	0.0464 ***	−0.0034
	(−0.28)	(5.82)	(−0.41)
Growth	−0.0139 *	−0.0007	−0.0139 *
	(−1.70)	(−0.09)	(−1.70)
Tobin's Q	0.0652 ***	0.1305 ***	0.0623 ***
	(6.75)	(13.95)	(6.40)
Cash	0.0175 **	0.1793 ***	0.0135
	(2.02)	(21.36)	(1.54)
PPE	−0.0448 ***	−0.1141 ***	−0.0423 ***
	(−5.15)	(−13.53)	(−4.82)
TOP 10	−0.0260 ***	0.0623 ***	−0.0274 ***
	(−3.08)	(7.62)	(−3.24)
Indiratio	0.0240 ***	−0.0262 ***	0.0247 ***
	(2.93)	(−3.30)	(3.00)
Year	YES	YES	YES
Ind	YES	YES	YES
Sample size	13685	13685	13685
Adjusted R2	0.0888	0.1465	0.0892
F-value	111.05	195.49	103.04

Source: Own study. Note: ***, **, and * indicate significance at the 1, 5, and 10% levels, respectively.

4.4. Robustness Test

In order to further verify the robustness of the above regression results, the study changed the technical innovation variable and selected the number of invention patent applications as a measure of technical innovation for the model regression. Using invention patent applications is important because invention patent is the most innovative technology among all patent applications, and needs to produce disruptive or breakthrough results and reflect the quality of technological innovation output of enterprises. The regression results are shown in Table 7. After using alternative variables, model 1, model 2, and model 3 all pass the validation, and the conclusions are consistent with the previous regression results.

Table 7. Robustness test results.

Variables	Model (1) Innovation	Model (2) CSR	Model (3) Innovation
ICI	0.0267 ***	0.1521 ***	0.0221 **
	(3.12)	(18.55)	(2.55)
CSR			0.0302 ***
			(3.39)
Size	0.2963 ***	0.2193 ***	0.2897 ***
	(28.55)	(22.03)	(27.44)
State	−0.0162 *	0.0395 ***	−0.0174 *
	(−1.80)	(4.60)	(−1.94)
R&D	0.0525 ***	−0.0370 ***	0.0536 ***
	(5.95)	(−4.37)	(6.08)
Lev	0.0121	−0.0590 ***	0.0139
	(1.38)	(−7.64)	(1.58)
ROA	−0.0029	0.0464 ***	−0.0043
	(−0.34)	(5.82)	(−0.51)
Growth	−0.0113	−0.0007	−0.0113
	(−1.37)	(−0.09)	(−1.37)
Tobin's Q	0.0613 ***	0.1305 ***	0.0574 ***
	(6.29)	(13.95)	(5.84)
Cash	0.0144 *	0.1793 ***	0.0090
	(1.66)	(21.36)	(1.01)
PPE	−0.0395 ***	−0.1141 ***	−0.0360 ***
	(−4.49)	(−13.53)	(−4.07)
TOP10	−0.0460 ***	0.0623 ***	−0.0479 ***
	(−5.40)	(7.62)	(−5.61)
Indiratio	0.0073	−0.0262 ***	0.0081
	(0.88)	(−3.30)	(0.98)
Year	YES	YES	YES
Ind	YES	YES	YES
Sample size	13685	13685	13685
Adjusted R2	0.0725	0.1465	0.0733
F-value	89.07	195.49	83.17

Source: Own study. Note: ***, **, and * indicate significance at the 1, 5, and 10% levels, respectively.

5. Discussion and Conclusions

To explore the relationship between internal control, CSR, and technological innovation, this study analyzes the mechanism of internal control effectiveness on technological innovation by establishing a mediating effect model based on valid investigation samples of Chinese listed companies in Shanghai and Shenzhen A-shares from 2014 to 2019.

The following conclusions were obtained from the empirical study. The effectiveness of internal control is significantly and positively correlated with technological innovation, confirming that sound internal control is conducive to increasing the results of corporate technological innovation. This result is because effective internal controls help enhance the risk assessment of innovation projects and improve innovation efficiency through clear strategic management and information communication, thus promoting corporate technological innovation [12–15].

With the improvement of internal control effectiveness, enterprises will more actively promote the fulfillment of social responsibility, which confirms the stakeholder theory [38]. Enhancing internal control effectiveness helps guarantee the appropriateness of social responsibility decisions and optimize the efficiency of social responsibility resources input. Additionally, enhancing internal control effectiveness helps control the risks and costs in social responsibility fulfillment and promotes enterprises to fulfill social responsibility actively [24,25].

Corporate social responsibility plays a partially mediating role in the effectiveness of internal control affecting technological innovation, explaining the intrinsic mechanism of

internal control affecting technological innovation [34,35]. This conclusion suggests that internal control effectiveness on technological innovation does not directly, but indirectly, affect technological innovation through CSR. This point is also an essential breakthrough in this study.

This study has three main theoretical implications. First, this paper extends the study of factors influencing technological innovation by enhancing the understanding of the relationship between internal control effectiveness and technological innovation. Past studies have focused on exploring the influence of external environmental factors on technological innovation [8,10,11,43], and few have focused on the relationship between internal control effectiveness and technological innovation, thus neglecting the influence of internal factors on technological innovation in firms. This study starts from internal control effectiveness, which helps establish a theoretical link between internal control effectiveness and technological innovation.

Second, this paper explores the mechanism of internal control effectiveness on technological innovation based on the mediating effect of CSR. The study finds that internal control effectiveness can promote technological innovation through the transmission mechanism of CSR, which deepens our knowledge and understanding of the relationship between internal control effectiveness and technological innovation. While most previous studies have explored the direct impact of internal control effectiveness on technological innovation [12–15], this paper attempts to explore the black box of the mechanism of internal control effectiveness from the perspective of corporate social responsibility. The results show that both internal control effectiveness and corporate social responsibility are important influencing factors in promoting technological innovation in enterprises, thus complementing the theoretical study of technological innovation.

Finally, this study contributes to the internal control effectiveness literature by providing empirical evidence on the economic consequences of internal control effectiveness. Previous studies on the economic consequences of internal control effectiveness have focused on inefficient investment [51], capital costs [4], audit costs [52], and financial performance [53]. This study explores the impact of internal control effectiveness on technological innovation and enriches the theoretical study of internal control effectiveness.

The descriptive statistical analysis of samples reveals that the situation of listed companies in China is different. Firstly, they attach different degrees of importance to internal control, and there are gaps in the efficacy of internal control in different companies. Secondly, there are also some differences between differently listed companies in assuming and fulfilling social responsibility responsibilities. Finally, there is a huge difference in the profit level and growth space of differently listed companies regarding financial indicators. As shown in Table 1 and Figure 1, there is also a large gap between the same type of enterprises in different regions, and the industry is concentrated in manufacturing. The need to learn from the head of enterprises is obvious.

The study proposes two management implications. First, enterprises should pay full attention to internal control and effectively play the positive role of internal control on technological innovation. Improving internal control should not only start from the design of the internal control system, but also monitor whether the internal control system has played its proper role in the enterprise and guarantee the effective operation of the internal control system to reduce the project investment risk, optimize the innovation environment, and enhance the enterprises' technological innovation.

Secondly, technological innovation is not developed in isolation, and the innovation results should be closely integrated with the assumption of social responsibility. Therefore, enterprises should actively fulfill corporate social responsibility, pay full attention to stakeholders' rights and interests, incorporate social responsibility into strategic management, pay high attention to social responsibility from the overall strategy, and let technological innovation serve social progress and sustainable development.

However, there are also some limitations. First, the relevant data are obtained from the empirical data of Chinese listed companies, so the study results may not be internationally

applicable to a certain extent. Secondly, because of the large amount of listed data in China, the sample size is still large after excluding some companies from the sample selection, which may interfere with the study findings. The study controls some variables, such as year and industry, during the empirical analysis. Future research is specific to industries with higher technological innovation, such as the manufacturing industries.

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What Drives Rural Consumers to Change E-Commerce Attitude and Adopt E-Commerce through the Moderating Role of Corporate Social Responsibility in an Emerging Market? An Empirical Investigation in the Chinese Context

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Abstract: The present study aims to introduce a comprehensive framework that may help to better understand how to make rural consumers hold a favorable attitude and enhance their willingness to adopt e-commerce. To empirically assess the hypotheses posited in this paper, we started by conducting a qualitative interview-based study of 104 rural consumers. This analysis elucidates new problems or challenges faced by rural consumers in impoverished areas after several years of experience in e-commerce. To further understand the service quality and cultural context effects, we conducted a quantitative study in 434 rural consumers in relatively underdeveloped areas of China. Using a partial least squares of structural equation modeling (SEM) approach through smart PLS, this study empirically tested the hypotheses posited in the paper. The SEM results demonstrate a positive relationship between logistics and training service quality, subjective norms, self-efficiency sense, and rural consumers' attitudes toward e-commerce platforms, which in turn positively contributes to their willingness to engage in word-of-mouth e-commerce promotion. In addition, it is shown empirically that corporate social responsibility positively moderates the effects of logistics and training services, subjective norms, and attitudes toward the use of e-commerce platforms. The findings from these two studies contribute to a better understanding of, and have major implications for, successful e-commerce entrepreneurial practices in areas undergoing the process of transition to an important emerging e-commerce marketplace.

Keywords: logistics service; training service; subjective norms; self-efficiency sense; corporate social responsibility; elaboration likelihood model; attitude; word-of-mouth

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1. Introduction

Poverty is a universal economic phenomenon. Nowadays, approximately 85% of the global population spend less than USD 30.00, two-thirds spend less than USD 10.00, and 10% spend less than USD 1.90 for daily living expenses [1]. Remarkable achievements have been made in reducing global poverty over the past few decades, but the downward trend has slowed down since 2010. Poverty eradication is the biggest challenge globally, and addressing it is an inevitable requirement for adhering to sustainable development [2].

Governmental departments and non-governmental organizations (NGOs) of different countries have attempted to eliminate poverty in various forms using different methods. Many international organizations, such as the United Nations and the World Bank, or national governmental agencies like the Department for International Development (DFID) in the United Kingdom have suggested that the government guide firms to fulfill their social responsibilities in poverty alleviation [3]. Corporate social responsibility (CSR) fulfillment helps solve unemployment, protect the environment and resources, narrow social gaps, and eliminate social instabilities. Guiding firms to fulfill their social responsibilities correctly is significant to promoting economic society's sustainable development. At present, CSR

fulfillment has been well-practiced. However, compared with the rapid economic growth, CSR fulfillment is not widely adopted to address many problems.

An epidemic has caught the world off guard. As various countries fight COVID-19, online shopping has become increasingly popular and inclusive of young people in urban and rural areas. Online shopping allows people to buy their favorite products online without leaving home and provides opportunities for people to start businesses in rural areas. E-commerce has extended to poor rural areas and brought new energy to poverty alleviation and rural revitalization, facilitating urban consumption and helping poor areas eliminate poverty and become rich. IT firms are proven to have a bright future in e-commerce poverty alleviation. They share resources and technologies throughout the internet, contributing to poverty eradication [4,5], and maintain normal business operations, even during an epidemic [6].

E-commerce poverty alleviation is a project promoted by information and communication technology, requiring multi-party and multi-pronged efforts to solve the poverty problem [7]. In China, e-commerce poverty alleviation is in full swing. E-commerce has been used in many poor areas and hoped to change the current poor living conditions. However, the opposite has happened, because many young and middle-aged people in rural areas work in cities, leaving behind a group of old people, women, and children who have limited knowledge about, and low enthusiasm for, e-commerce. In 2018, the e-commerce alliance helped Tailai County in Heilongjiang Province of China promote Tailai rice. Compared with previous years, its annual sales increased significantly. Accordingly, the income of 3400 poor people increased. However, peasants could not keep up with the brand's development, given the lack of actual productivity, and the benefits of poverty alleviation have not been evident [8].

Poverty alleviation has entered a crucial stage. In the post epidemic era, popularizing ecommerce to the bottom of society, including poverty-stricken areas that are easily forgotten, and alleviating e-commerce poverty are essential to sustainable development. The previous literature has shown that e-commerce poverty alleviation, dominated by the government, should focus on cultivating potential participants [9]. An ecosystem should be established in poverty-stricken areas based on e-commerce platforms, and the system should meet the demand of self-sufficiency to alleviate poverty [7,10]. The previous literature did not pay attention to the attitudes of rural consumers toward e-commerce in poverty-stricken areas. It did not cover solving the remaining problems in e-commerce poverty alleviation. Thus, the objective of the present study is to explore the influencing factors on rural consumers' attitude toward the use of e-commerce in poverty-stricken areas. It also aims to determine and understand the mechanisms that make rural consumers in poverty-stricken areas change their prejudice and attitude toward e-commerce to promote e-commerce poverty alleviation and benefit poverty-stricken areas. In doing so, this study proposes that logistics and training service quality, subjective norms, and self-efficiency sense will have a positive impact on rural consumers' attitude toward e-commerce platforms which in turn is argued to positively shape the willingness of these consumers to engage in word of mouth (WOM). Furthermore, the study proposes that rural consumers' attitude toward e-commerce may not be influenced equally by the logistics and training service quality, subjective norms, and self-efficiency sense, because they face different external conditions. In particular, this paper argues that rural consumers' perceptions regarding the external force in local markets, namely, the CSR engagement of e-commerce firms, helps motivate rural consumers who perceive a high quality of logistics and training service, subjective norms, and self-efficiency sense to have a more positive attitude toward e-commerce and thus drive them to more actively engage in WOM.

Our paper offers three important contributions to literature. First, our study contributes to understanding the effect of quality of different services and consumers' unique characteristics on consumers' attitude toward e-commerce, which in turn is expected to positively impact the willingness of the consumers to engage in WOM. Second, this study explores the conditions under which such service quality and consumer character-

istics contribute to a more positive attitude. In doing so, this study clarifies theoretically the positive influence of CSR on the contributions of logistics and training service quality, subjective norms, and self-efficiency sense to consumer attitude toward e-commerce. Furthermore, by explicitly considering the importance of consumers in rural areas in helping e-commerce firms better expand their business and by providing the first empirical test using both quality and quantity data, this paper proposes that the determinants of consumer attitude toward e-commerce may not be always universal. To sum up, our study conceptually and analytically links logistics and training service quality, subjective norms, and self-efficiency sense with consumer attitude and willingness to engage in WOM by incorporating the potential role of CSR in moderating such relationships, thus contributing to better understanding and having implications for successful e-commerce entrepreneurial practices in areas undergoing the process of transition to an important emerging e-commerce marketplace.

2. Theoretical Background and Hypothesis Development

Petty and Cacioppo first proposed the elaboration likelihood model (ELM) in 1986. It is regarded as a basic theoretical framework that deals with persuasive information to change original attitudes [11]. Central and peripheral routes trigger attitude change between individuals. In other words, people process information by receiving information and being persuaded to accept it. The attitude change caused by the central route is more lasting, stable, and predictable for long-term behavior. It is a choice made after thoughtful, rational thinking. On the contrary, the attitude change caused by the peripheral route is more unstable. It is just a short-term attitude change and is easily affected by opposite persuasion information.

For individuals, the difference may be that the receivers have a different understanding of the learning process and content [12]. The potential elaboration of the receivers is based on the information they receive to generate their ideas [13]. Individuals' route choices depend on their elaboration degree of knowledge. High elaboration likelihood drives individuals to review carefully or deal with the quality of information deeply to accept a persuaded argument. The receivers evaluate the problems presented in the message to accept cognitive processing [14]. People with low elaboration likelihood are easily affected by peripheral clues. This influence leads to new cognition formation to change the original attitude [15].

The present study is largely motivated to explore how to persuade rural consumers in poverty-stricken areas to change their attitude toward e-commerce and recommend it to others. Given information persuasion theory, taking the ELM model as the typical example, this study uses ELM as the theoretical basis, combs the central and peripheral route factors in e-commerce poverty alleviation, and explores the influencing factors on the attitude change of rural consumers in poverty-stricken areas toward e-commerce use by combining with the characteristics of e-commerce poverty alleviation. This study investigates the attitude of rural consumers toward e-commerce poverty alleviation from the perspective of ELM. ELM can help us to understand how firms evaluate the attitude of rural consumers toward e-commerce poverty alleviation and their communication intention by using their features, and to change rural consumers' dependence on donations.

Based on the ELM model, firm training and logistics services provided by e-commerce firms are used as the central route. In contrast, self-efficiency sense and subjective norms are used as the peripheral route. By further exploring the moderating effect of perceived CSR on the relationships between central and peripheral routes and attitude toward e-commerce use, this study holds that the contribution of central and peripheral routes to attitude of rural consumers toward e-commerce is likely to be dependent on the degree of perceived CSR. If the degree of perceived CSR of e-commerce is higher, rural consumers who perceive service quality highly are more likely to have a positive attitude toward e-commerce. Furthermore, such rural consumers are expected to be more likely to recommend the use of e-commerce use to others by actively engaging in WOM.

On the contrary, rural consumers are likely to prefer the peripheral route if perceived CSR is lower. Self-efficiency sense and subjective norms are higher, and attitude toward the ecommerce in use is easier to change. Although this adoption is a short and unstable change, it affects the intention to engage in WOM. On the basis of the ELM model, this study discusses in-depth the relationships between the perceived quality of services, the sense of CSR, and personal characteristics with changes in attitude toward the adopted e-commerce and intention to engage in WOM. On the basis of the characteristics of e-commerce poverty alleviation, the central and peripheral routes of e-commerce poverty alleviation are combed.

2.1. Perceived Quality of Training Service

One of the keys to successful firm operations is the quality of service [16]. High-quality service improves external customers' positive recognition of the organization and constantly affects customers' behavior to accept the organization's service [17]. High quality of service can also increase the positive emotional responses of customers [18] and improve positive decision-making [19]. The quality of service that individuals perceive positively affects customers' attitude and changes their original attitude of rejection [20–22]. Training service generally refers to the initial ability of the business operation of relevant technologies to teach skills or share knowledge for firm employees to maintain and upgrade their technical capabilities throughout their working career, promote relevant enterprises, and improve quality and efficiency [23]. To ensure that employees use the gained knowledge and skills, firms provide employees with training services [24] to enliven the service atmosphere [25] and improve the service quality [26]. Individuals must have professional knowledge in IT, upstream and downstream docking, and network marketing in e-commerce platforms. Rural consumers are unlikely to have such knowledge without receiving professional training. A large number of compound talents who are proficient in network technology and familiar with the operation law of the agricultural economy are required in the marketing of agricultural products. They need to spend a lot of time on learning and training. Furthermore, relevant cognition in training can positively impact employees' commitment to the organization [27], affecting the service quality for rural consumers in the operation of e-commerce platforms [28]. Therefore, helping rural consumers with technology and improving their capabilities is the key to help them complete the operation of e-commerce platforms [29].

In poverty-stricken areas, e-commerce talents are scarce, and understanding e-commerce, information technology, and relevant knowledge is low. To make more rural customers adopt e-commerce platforms, firms must train them to improve their knowledge of e-commerce and functional skills to use e-commerce. Such training will enable rural consumers to take a positive attitude toward the use of e-commerce. If the perceived quality of e-commerce training services is higher, the attitudes toward adopting e-commerce platforms will be more positive. Thus, the following hypothesis is proposed:

Hypothesis 1 (H1). *The perceived quality of service provided by e-commerce firms positively impacts rural consumers' attitudes toward e-commerce use.*

2.2. Perceived Quality of Logistics Service

A logistics distribution system must match e-commerce activities. Poor rural areas are remote, with inconvenient transportation and low total logistics, resulting in high distribution costs, which often restricts the development of e-commerce and affects e-commerce poverty alleviation. Logistics service affects the profit and income of firms [30] and is the reason for various marketing products to compete [31]. Therefore, how to conduct the development and improvement of e-commerce logistics systems in poverty-stricken areas is one of the main factors affecting the development of projects for e-commerce poverty alleviation.

Logistics service quality generally refers to the service that allows firms to send goods to the correct places following accurate information regarding quantity and price, state, and time to fulfill customer needs and ensure customer satisfaction [32,33]. The key to improving logistics service quality is the interaction between firms and customers, with the customer at the center [34]. When a firm has high communication and information technology, improving logistics service quality positively impacts customer satisfaction [35–37]. Customer satisfaction is a critical factor for customers to adopt e-commerce. If the quality of logistics service is higher, the attitude of rural consumers toward e-commerce platforms will be more positive. Thus, the following hypothesis is proposed:

Hypothesis 2 (H2). *The perceived quality of logistics service provided by e-commerce firms positively impacts rural consumers' attitudes toward e-commerce use.*

2.3. Subjective Norms

Subjective norms reflect individuals' social pressure perceived from the behaviors performed or not performed. Subjective norms often refer to the suggestions of individuals or groups, motivating them to take a specific action [38,39]. Individuals may adopt and act if their family, friends, relatives, and colleagues hope that they do so [40]. Subjective norms can affect use behavior. When individuals receive hopes, suggestions, and opinions from others, they will exert effort to perform [41,42]. In cross-cultural research, subjective norms also directly affect attitudes and directly and indirectly affect behavioral intentions [43–45]. In poverty-stricken areas, young adults go out to work, and most of the rural consumers are the elderly, women, and children. Given the constant attack of e-commerce on the real economy, online shopping and sales have become necessary. Subjective norms from the pressure of the social environment and the people around them are expected to impact rural consumers' attitude toward ecommerce positively. To sum up, the following hypothesis is proposed:

Hypothesis 3 (H3). *The subjective norms of rural consumers positively impact rural consumers' attitudes toward e-commerce use.*

2.4. Self-Efficiency Sense

Self-efficiency sense is the belief that an individual can mobilize the motivation, cognitive resources, and action process required to meet the requirements of specific situations [46]. The core faith is that individuals can make a change by taking action [47]. People with high self-efficiency sense believe that they are more effective, successful, and healthy than those with low self-efficiency sense in goal achievement [48]. Self-efficiency sense will affect individuals to deal with the possible things in the future based on their capacities. E-commerce is new for rural consumers in poverty-stricken areas. Having a self-efficiency sense is particularly important to master the operation ability of e-commerce through learning. In other words, if the rural consumers have a stronger self-efficiency sense to e-commerce, the attitude toward ecommerce will be more positive. Thus, the following hypothesis is proposed:

Hypothesis 4 (H4). *The self-efficiency sense positively impacts rural consumers' attitudes toward e-commerce use.*

2.5. The Moderating Effect of Corporate Social Responsibility

No consensus has been made concerning the definition of CSR [49]. However, it is generally referred to as discretionary activities or actions of a firm that protects the interests of stakeholder groups or a larger societal collective by voluntarily contributing public welfare value to society to achieve the firm's sustainable development [50,51]. Firms' engagement in CSR activities can improve the reputation of firms and increase their profits [52], which positively impacts consumer buying behavior [53,54] and satisfaction [55].

CSR involves being responsible to shareholders and stakeholders [56]. CSR means that the firm's stakeholders are treated in good ethics or in a socially responsible way. The stakeholders who have direct (board of directors, shareholders, and management) or indirect (employees, customers, and competitors) interest relations with the firm are groups or individuals that can affect or be affected by the achievement of organizational objectives [57]. Rural consumers in poverty-stricken areas are the largest potential customer group in ecommerce platforms. To change the rural consumers' attitude toward e-commerce use, firms should enhance their CSR and fully meet the needs of consumers for quality services [58,59]. Thus, the engagement in CSR activities is expected to play an important moderating role in explaining the perceived quality of training and logistics services offered by e-commerce firms to the attitude of real personnel toward e-commerce use. On this basis, the following hypotheses are proposed:

Hypothesis 5a (H5a). *The degree of CSR positively moderates the relationship between perceived quality of training service and rural consumers' attitudes toward e-commerce use.*

Hypothesis 5b (H5b). *The degree of CSR positively moderates the relationship between perceived quality of logistics service and rural consumers' attitudes toward e-commerce use.*

Based on behavioral theory, when an individual's subjective norms for a specific behavior are better, this person will strongly demonstrate the behavior [38]. In other words, the individual wants to develop the e-commerce platform in poverty-stricken areas and change rural consumers' attitudes toward e-commerce use. A person's attitude changes when firms influence stakeholders by persuading surrounding people to pressure the person concerned [60]. Firms should improve their social responsibility to encourage customers to take the initiative to convince the people surrounding rural consumers. If CSR is higher, firms' image in society will be better [61], and consumers will be more willing to deal with firms with stronger CSR [62,63]. Furthermore, higher CSR causes rural consumers to have a positive attitude toward the firm's e-commerce platform. Therefore, when CSR is higher, it can better adjust individuals' subjective norms and make them more willing to take positive attitudes toward e-commerce use. In other words, CSR is predicted to play a positive moderating role in shaping the relationship between subjective norms and the attitude of rural consumers toward e-commerce use.

Self-efficiency sense is the confidence in the belief that an individual can mobilize the motivation, cognitive resources, and action process required to meet the requirements of specific situations [46]. Furthermore, self-efficiency sense plays an important role when facing challenges and goals [64]. When dealing with new things and new challenges, if self-efficiency sense is not enough, they do not invest too much energy and effort to try something new [65]. Generally, people can be motivated to behave under the external influence by observing and learning others' behaviors to guide their subsequent behaviors [66].

At present, the pursuit of profit maximization is not the only criterion for business success. More and more firms use CSR practices to influence their main stakeholders' cognition, emotion, and behavior [67,68]. Investment of firms in CSR activities can trigger consumers' positive reactions [69]. In other words, whether e-commerce firms engage in CSR activities in poverty-stricken areas has been perceived by rural consumers plays a vital role in affecting the subsequent behaviors and reactions of these rural consumers. E-commerce firms can devote more resources to CSR activities by engaging in more 'love and help' activities, caring for socially vulnerable groups, and supporting rural consumers. This will make rural consumers more confident in using e-commerce, positively influencing the importance of self-efficiency in enhancing the real personnel attitude toward e-commerce use.

On the contrary, a negative perception of e-commerce firms' CSR activities may exert a negative external influence on rural consumers. Rural consumers will probably abandon themselves, disconnect from society, and lose their confidence in e-commerce

use, making them more reluctant to take a positive attitude toward e-commerce use. In short, rural consumers' perceived degree of CSR positively moderates the contribution of self-efficiency to rural consumers' attitudes toward e-commerce use. Therefore, the following relationships are proposed:

Hypothesis 5c (H5c). *The degree of CSR positively moderates the relationship between the subjective norms of rural consumers and their attitude toward e-commerce use.*

Hypothesis 5d (H5d). *The degree of CSR positively moderates the relationship between the self-efficiency sense of rural consumers and their attitude toward e-commerce use.*

2.6. Attitude and WOM Engagement Intention

Attitude refers to evaluating the likes and dislikes of perceived substances through the emotional response to facts [70]. It has a positive effect on behavior intention [38]. Especially when the attitude toward one thing is single, attitude will strongly impact behavior [71]. A good attitude can predict behavior intention [72–75].

According to Festinger's cognitive dissonance theory, people's cognitive system tends to maintain consistency. When cognitive dissonance happens, people will feel certain psychological pressure, driving people to reduce or eliminate the dissonance [76]. Rural consumers who have a positive attitude toward e-commerce use may regulate their cognitive system to be consistent to lower their psychological pressure. The intention to engage in WOM of rural consumers is predicted to be stronger when the cognition is more consonant; the intention to engage in WOM is expected to become weaker when cognition is more dissonant [77]. In other words, if the rural consumers' attitude toward e-commerce use is positive, their intention to engage in WOM may become strong. Thus, the following hypothesis is proposed:

Hypothesis 6 (H6). *Rural consumers' attitudes toward e-commerce use positively impact their intention to engage in WOM.*

The research framework of this research is presented in Figure 1.

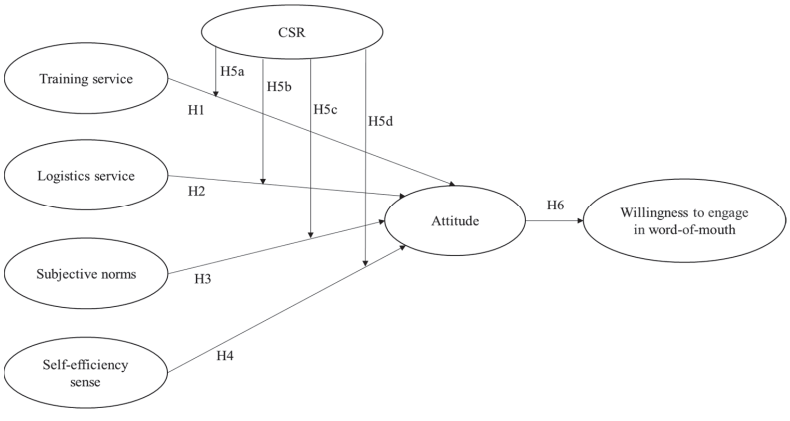

Figure 1. Conceptual framework.

3. Methodology

3.1. Research Setting

The present study aims to understand the experimental achievements and specifically identify the problems of poverty alleviation in China's e-commerce. This study explores what determines the attitude of consumers toward e-commerce, which in turn drives

their willingness to engage in WOM in rural areas, especially those living in the poor areas of China. To empirically test the hypotheses, survey data on a sample of Chinese consumers from rural areas were collected. China provides an appropriate setting for our study. China has launched an incremental market liberalization through reform and opening-up to boost its economic development over the past four decades. Given the substantial progress in economic development of China in urban areas, the country has shifted its focus on balancing development and reducing economic disparities between urban and rural areas by specifically advancing and promoting rural revitalization and speeding up the modernization of rural areas. To achieve this, the Chinese government is rapidly putting in place more sound mechanisms and breaking barriers that restrict the free flow of resources such as capital, talents, and information between urban and rural areas. The Chinese government has exerted considerable efforts to develop the rural areas by improving the delivery logistics system services and encouraging e-commerce and logistics firms to better expand their business and support the development of local e-commerce business sectors in rural areas. In addition, as the e-commerce giants in China face slower growth in the saturated urban markets in recent years, they are increasingly looking for gold in rural areas. Despite the ongoing rapid urbanization over the past few years, around 510 million people are still living in rural regions, which makes up approximately 36.11% of the total population. The number of internet users in rural areas accounts for more than 26% of the total internet user population in China. Rural consumers have been quickly emerging as a lucrative new market opportunity for e-commerce giants. For example, Alibaba, the largest e-commerce giant in China, launched an initiative called rural Taobao in 2014 and invested USD 717 million on rural supply chain logistics, warehousing, and technology in 2018 to expand e-commerce business to villagers living in rural areas. This initiative has benefited the e-commerce giant and people living in rural areas by lifting more people out of poverty and improving their livelihoods. Similarly, the second largest e-commerce giant, JD.com, has committed to investing heavily in improving logistics services in rural areas of China by hiring more delivery personnel to ensure adequate dedicated delivery men in every village to receive parcels and take them to different houses, and even testing the delivering service with drones to rural areas since 2016. With the efforts made by the Chinese government to facilitate the flow of consumer products to rural areas and encourage e-commence giants to expand business in rural areas, the country has achieved remarkable development in revitalizing rural areas and alleviating poverty. In fact, China has made a huge contribution to global poverty reduction by lifting hundreds of millions of Chinese people out of poverty and transferring labor from rural areas to urban ones. Roughly 860 million people were living in urban areas by the end of 2020, and nearly 160 million of them were rural migrant workers. Against the background of the continuous progress of IT and digital technology, the e-commerce platforms in China have rapidly become a new means and key channel to revitalize rural areas and alleviate poverty. According to the statistics of the Chinese Ministry of Commerce (MOFCOM), there were 989 million internet users, with the internet penetration rate reaching more than 70% by the end of December 2020. Approximately 309 million of them were rural internet users. Various forms of poverty alleviation by e-commerce have been rapidly emerging in rural areas across the country. Currently, e-commerce has expanded to the countryside to achieve full coverage of 832 state-level poor counties. The online retail sales in these areas have reached more than 301 billion yuan (approximately USD 43.1 billion using the official exchange rate) in 2020, up by 20% on a yearly basis. More than 3 million e-commerce business operators were in these Chinese state-level poor counties by the end of 2020, which increased by 366,000 from 2019 (up by 13.7%). The e-commerce poverty alleviation has entered a stage of sophisticated poverty relief. The practical experience gained by China e-commerce poverty alleviation has also provided reference experience for the industry. The present rural consumers are largely different from urban consumers. As more than 160 million rural migrant workers were transferred from rural to urban areas, the consumers currently living in rural areas are relatively old people and may not be

very familiar with online shopping. This study intends to understand the experimental achievements and specifically identify the problems of poverty alleviation in China's e-commerce. The data were collected through surveys of rural consumers (*liu shou ren yuan* or rear personnel) in Leizhou City of Guangdong province.

3.2. In-Depth Field Interviews

To gain insight into the focal phenomenon, i.e., the latest rural consumers' attitudes toward the adoption of e-commerce and important sources of their intention to engage in e-commerce WOM, a series of onsite in-depth interviews with the rural consumers in the area were conducted before administering the questionnaires. An e-commerce poverty alleviation project in a rural area located in Leizhou City in Guangdong Province of China was taken as a survey sample and conducted 104 onsite field interviews with rural consumers in the region to identify major problems or challenges that are faced by rural consumers in the early stage of e-commerce development and thus need to be urgently solved in e-commerce poverty alleviation. Our in-depth field interviews with rural consumers in the rural county located in Leizhou City of Guangdong Province in China suggest that, in general, the current e-commerce platform project was not carried out smoothly among the rural consumers in such poverty-stricken areas. One of the important reasons is that the construction of communication and other infrastructure is relatively weak in poverty-stricken areas. In terms of transportation, in the region where onsite field interviews were conducted, there was only one bus road there, which goes to the town directly, which is argued by the interviewers to significantly influence the batch transportation of goods. In terms of internet coverage, the region is relatively far and remote and has poor network signal. Nearly 70% of the rural consumers in the region did not have a computer at home, and approximately 40% of the rural consumers did not have a TV at home. Therefore, this region cannot reach the level of e-commerce development. Our interviews clearly demonstrate that the development of infrastructure construction dramatically affects the development of e-commerce in such poverty-stricken areas.

In addition, our interviews also revealed the fact that rural consumers in such poverty-stricken areas tended to lack awareness of the concept of e-commerce. Generally speaking, young people aged 20–35 should be the 'principal force' of online shopping. However, the young rural consumers aged 20–35 prefer to shop directly in a store. The reason may be that a perfect e-logistics system had not been established yet. The development of e-commerce must be based on perfect traffic conditions, a high-quality network environment, and some supporting infrastructure construction. Therefore, building an ideal network space and a sound logistics system is believed to be the foundation for e-commerce poverty alleviation to have a stable development platform under the background of 'internet + strategy'. Given the lack of an e-logistics system, a small quantity of local agricultural products is sold. Therefore, they can only cooperate with the third-party logistics companies, but no fixed companies in cooperation virtually increase the costs of buyers and sellers. Another problem is the lack of professional e-commerce talent training. The results of our field interviews are summarized in Tables 1 and 2.

Table 1. Results of onsite filed interviews with rural consumers.

Selected Interview Questions	Major Concerns/Issues	%
Please list the main issues that you are most concerned about for e-commerce.	■ training service	24.04
	■ after-sales service	7.45
	■ speed of logistics	18.27
	■ convenient payment	4.57
	■ CSR	20.67
	■ subjective norms	14.42
	■ self-efficiency sense	10.58
Have you heard of e-commerce?	■ yes	72.12
	■ no	27.88
Please list the primary reasons why you don't use e-commerce.	■ slow logistics	27.88
	■ no home delivery service	17.31
	■ poor after-sales service	14.74
	■ unfamiliar to e-commerce	32.69
	■ inconvenient online payment	7.38
Have you ever seen advertisements promoting e-commerce?	■ often	9.62
	■ occasionally	31.73
	■ never	58.65
How often do you visit e-commerce platforms?	■ once a week or more	16.35
	■ every two weeks	8.65
	■ once a month	30.77
	■ only when in demand	40.38
	■ hardly visits	3.85

Table 2. Major factor inhibiting the use of e-commerce for rural consumers.

Would You Please Tell Me Why You Do Not Choose E-Commerce?
"We are relatively poor here, with an underdeveloped network. E-commerce cannot go on well, even if it comes in. There were firms coming in before. They worked well at first. Later, they were basically of little use as soon as they left" (male, 52 years old, 16 January 2021).
"We do not know what e-commerce is and how to work or operate it. No one teaches us. It is too difficult for women who do housework at home all year round" (female, 35 years old, 16 January 2021).
"I have heard a little about e-commerce poverty alleviation. After all, I saw it on TV sometimes. However, there is a lot of online fraud at present. If no professionals teach us, or the firm here is not responsible, I am unwilling to try e-commerce. After all, it seems that the risk is more significant than the benefit. At least that's how I feel" (male, 45 years old, 16 January 2021).
"A lot of farm work at home cannot be finished. I have to take care of the elderly and children. I do not have time to pay attention to this. In addition, I find that no neighbor is using it. I do not know what it can bring. Therefore, we usually like to go to the store to buy what we want" (female, 42 years old, 16 January 2021).
"I have to ride a bike to pick up the goods bought online in a town several kilometers away, let doing e-commerce alone. In addition, even if we do, the traffic here is inconvenient. There is only one cement road. It is a little difficult for a big truck to pass through" (male, 32 years old, 16 January 2021).

3.3. Sampling and Data Collection

To develop the survey instrument for the study, a careful process was followed by first developing an English-language version of the survey instrument and then translating it into Chinese with the help of two independent native speakers. To ensure conceptual equivalence and check for form and meaning accuracy, the Chinese version of the survey instrument was back-translated into English by two additional independent translators who are competent in Chinese and English. To ensure the content and validity of the measures, our survey instruments were pre-tested with 30 rural consumers (i.e., rear personnel) in the region. Basing on the feedback from the pre-tests, a few questionnaire items were further modified to ensure their relevance and clarity of the questionnaire items. Given the potential challenges faced in collecting sufficient primary data in China and the importance of the development of trust increasing high-quality responses, the survey was

administered with the help of a renewed research company in the Chinese local market to encourage survey participation and enhance the high-quality response rate. Finally, a total of 466 questionnaires were collected. After excluding 32 irrelevant or incomplete responses, a total of 434 completed and usable questionnaires were retained for analysis. Among the respondents, 39.6% were male, 71.3% were married, around 75.6% had completed either a college degree or a high school or less education, and the average age was 41.3 years.

3.4. Bias Testing

To verify the presence of nonresponse bias in the data that may possibly influence our statistical results, the differences between responding and nonresponding consumers as well as the consumers that responded to our survey early against those that responded late were compared on key constructs and consumer demographic characteristics. To check for this potential threat to validity, the early-responding consumers were considered as the proxy for responding consumers and the late-responding consumers as the proxy for non-responding consumers under the assumption that the consumers responded late are more similar to nonresponding consumers than those responded early to those nonresponding ones [78]. To further assess potential nonresponse bias, the differences between complete and partially complete questionnaires were also compared. Our results of a *t*-test show that there was so statistically significant difference between the consumers that responded to our survey early and those that responded late as well as the complete and partially complete questionnaires, suggesting that no evidence of a serious concern on response bias in our data [78].

In addition, as the use of self-report survey data may suffer from potential common method variance (CMV), appropriate questionnaire design and sample procedures were implemented to reduce potential CMV. First, when designing our survey instrument, the measures of our constructs were separated into several subsections and used different formats to mitigate a simple "straight line" pattern of response [79,80]. Second, to avoid the potential presence of CMV-biased response patterns, the order of the questions on the questionnaire were randomized using survey software and reversed the scaling on several questions. More importantly, all respondents were promised the strict anonymity and confidentiality of their responses in the survey cover letter. In particular, to reduce potential social desirability bias on self-report survey data, all respondents were informed that that there were no right or wrong answers to the questions, that they should simply respond to each question as honestly as possible, and that their responses would be only used for the sake of academic research. and which reduced the potential social desirability bias. Nevertheless, the possibility of CMV were examined by performing Harman's one-factor test [81]. In doing so, exploratory factor analysis is performed by entering the variables in the study into a nonrotated factor analysis and the results of the one-factor analysis indicate that several factors, as opposed to one single factor, emerged and the first factor did not account for the majority of the variance.

Moreover, the presence of CMV was also assessed using the marker-variable technique [82,83]. A marker variable, i.e., attitude of the respondent toward blue color, was included in the model and significant relationships were not found between the marker variable and all latent variables in the model, and any significant change in the variance explained in the dependent variables. While CMV in the analysis cannot be completely ruled out, the results of a variety of techniques to empirically assess CMV suggest that CMV did not seem to be a significant concern for our analysis.

3.5. Variables and Measurement

In this study, well-established scales derived from prior research were used and modified specifically for this study to measure consumers' attitude toward the adoption of e-commerce, their willingness to promote the use of e-commerce by engaging in WOM, their perceived logistics and training service quality, and the degree of their subjective norms and self-efficiency sense. Unless noted otherwise, all the dependent, independent,

and moderating variables in the study were assessed using multiple-item, seven-point Likert scales ranging from "strongly disagree" (1) to "strongly agree" (7).

Consistent with prior research [84,85], three items were used to measure rural consumers' willingness to engage in WOM for promoting the adoption of e-commerce. To measure consumers' attitude toward the use of e-commerce, five items derived from prior research were used [86–88]. To measure the perceived quality of training service, ten items were adopted from the literature [89,90] and modified specifically for the study. As two items were dropped from the scale since they did not have a loading of at least 0.40 in the factor analysis, eight items were used to measure the quality of training service in the analysis. To capture the perceived quality of logistics service, nine items were adopted from Mentzer, Flint, and Hult [31]. As two items were dropped from the scale since they did not load onto the constructs of interest in the factor analysis, the quality of logistics service were thus measured using seven items. To measure the degree of subjective norms, eight items derived from prior studies were adopted [91–93]. To capture the degree of self-efficiency sense, eight items derived from the literature were adopted [94,95]. Lastly, to measure rural consumers' perceived degree of the engagement in corporate social responsibility (CSR) of e-commerce firms, 10 items were adopted from Luo [96] and Isabelle [97] and modified them specifically for this study. As three items were dropped from the scale since they did not have a loading of at least 0.40 in the factor analysis, seven items were used to measure the perceived degree of CSR in the study.

4. Analyses and Results

In this study, partial least squares (PLS) structural equation modeling (SEM) was used to empirically test our research hypotheses [98]. Before empirically testing the hypotheses, the reliability and validity of the constructs were first assessed by checking the measurement model.

4.1. Measure Reliability and Validity

Table 3 presents the results of the measurement assessment, which summarizes the means, standard deviations, factor loadings, construct reliabilities, and the average variances extracted (AVEs). Since all the established scales were used to measure the variables in this study, all measures exhibit strong reliability and validity. In PLS, item reliability is assessed by examining item loadings. As shown in Table 3, all item loadings are statistically significant, with values greater than 0.80, and thus clearly in excess of the recommended threshold of 0.7 [99], providing evidence of high item reliability and strong reliability of our measurement model [100,101]. To assess the internal reliability, the Cronbach's alpha of constructs and composite reliabilities were examined. As reported in Table 3, all the Cronbach's alpha values, ranging from 0.867 to 0.949, and composite reliabilities, ranging from 0.898 to 0.957, are greater than 0.80, exceeding the 0.70 benchmark [102,103]. Therefore, our constructs exhibit strong internal reliability and convergent validity. The AVE values for the constructs were also calculated and the results showed that all values are above the recommended threshold of 0.50, indicating convergent validity and reliability of the measures in the study [102]. To assess discriminant validity, the square root of AVE of each construct were compared with correlation between the construct and other constructs in the model. As shown in Table 4, the results confirmed that the square root of the AVE values calculated for each of the constructs along the diagonal is higher than the correlations between different respective constructs in the corresponding off-diagonal elements of the matrix, providing an adequate discriminant validity of the measures in our sample [102]. To further verify the discriminant validity of the measures, the loading values of each single indicator were also compared with the cross-loadings with other indicators and the results show that each indicator loading is higher than the respective cross loadings, again suggesting the discriminant validity of the measures is adequate. Moreover, the heterotrait-monotrait ratio (HTMT) of the correlations was checked [104] and the results indicated that all HTMT correlations values are not greater than 0.85, suggesting adequate

discriminant validity for all constructs in the model. Lastly, following prior work [105,106], Stone–Geisser's Q^2 was used to assess the predictive validity of the latent constructs in the model using and the results showed that the cross-validated communality and redundancy values are higher than zero, ranging from 0.436 to 0.448, indicating adequate predictive validity in the model [100,107]. Overall, all the constructs and their respective indicators therefore exhibit strong reliability and validity in the context of this study.

Table 3. Descriptive statistics and validity assessments of the constructs.

Construct and Indicators	Mean	STD	SFL	Cronbach's Alpha	CR	AVE
Perceived logistics service quality (LSQ)				0.945	0.955	0.751
LSQ1	5.491	1.533	0.865			
LSQ2	5.583	1.367	0.863			
LSQ3	5.643	1.328	0.862			
LSQ4	5.548	1.284	0.864			
LSQ5	5.620	1.254	0.869			
LSQ6	5.597	1.375	0.869			
LSQ7	5.599	1.437	0.874			
Perceived training service quality (TSQ)				0.932	0.944	0.678
TSQ1	5.295	1.563	0.837			
TSQ2	5.290	1.490	0.827			
TSQ3	5.129	1.436	0.840			
TSQ4	5.281	1.433	0.835			
TSQ5	5.698	1.457	0.787			
TSQ6	5.023	1.696	0.804			
TSQ7	4.843	1.789	0.806			
TSQ8	5.350	1.520	0.848			
Subjective norms (SN)				0.949	0.957	0.736
SN1	5.479	1.406	0.849			
SN2	5.535	1.404	0.867			
SN3	5.475	1.401	0.865			
SN4	5.505	1.274	0.864			
SN5	5.521	1.311	0.857			
SN6	5.507	1.361	0.863			
SN7	5.525	1.356	0.866			
SN8	5.304	1.537	0.834			
Self-efficiency sense (SES)				0.946	0.955	0.727
SES1	5.438	1.431	0.859			
SES2	5.512	1.388	0.858			
SES3	5.459	1.437	0.861			
SES4	5.546	1.394	0.859			
SES5	5.530	1.385	0.860			
SES6	5.753	1.358	0.857			
SES7	5.438	1.431	0.856			
SES8	5.594	1.329	0.809			
Perceived corporate social responsibility (CSR)				0.867	0.898	0.557
CSR1	6.366	1.046	0.782			
CSR2	6.359	0.786	0.714			
CSR3	6.410	0.802	0.717			
CSR4	6.295	1.215	0.705			
CSR5	6.286	1.122	0.704			
CSR6	6.309	1.095	0.789			
CSR7	6.353	1.022	0.806			
Attitude toward the use of e-commerce (AU)				0.903	0.928	0.721
AU1	5.177	1.671	0.816			
AU2	5.719	1.389	0.869			
AU3	5.664	1.395	0.870			
AU4	5.539	1.344	0.840			
AU5	5.753	1.431	0.849			
Intention of WOM engagement (WOM)				0.896	0.935	0.828
WOM1	5.399	1.353	0.912			
WOM2	5.415	1.436	0.911			
WOM3	5.371	1.392	0.907			

Note: SFL = standardized factor loading, AVE = average variance extracted, CR = composite reliability, STD = standard deviation. Due to space limitations, detailed measurement items are omitted, but they are available from the corresponding author upon request.

Table 4. Correlations and discriminant validity among the constructs.

Variables	1	2	3	4	5	6	7
1. Perceived logistics service quality	***0.867***						
2. Perceived training service quality	0.536	***0.823***					
3. Subjective norms	0.522	0.552	***0.858***				
4. Self-efficiency sense	0.389	0.502	0.532	***0.853***			
5. Perceived corporate social responsibility	0.448	0.334	0.435	0.363	***0.746***		
6. Attitude	0.622	0.674	0.649	0.586	0.474	***0.849***	
7. Intention of WOM engagement	0.488	0.590	0.629	0.531	0.343	0.753	***0.910***

Note: Values in italicized bold denote the square root of the AVE of each construct.

4.2. Hypothesis Testing

Following the measurement model estimation, the theoretical model was empirically tested and the results of hypothesis testing and the amounts of explained variance in consumer attitude toward the use of e-commerce and the willingness to engage in WOM were presented in Figure 2. The overall structural model fit was assessed by checking for the standardized root mean square residual (SRMR) value. Our model had an SRMR value of 0.048, thereby indicating an excellent fit [102]. To test the statistical significance of path estimates, Chin's [96] approach was followed using a bootstrap approach. More specifically, the coefficient of determination R^2 and the path coefficient with their respective t-values were estimated. The R^2 values for the two endogenous variables (e.g., attitude toward the use of e-commerce and willingness to engage in WOM) indicate satisfactory explanatory power for our model (ranging from 0.567 to 0.640). Overall, the results presented in Figure 2 indicate that the constructs are largely related in the theoretically predicted manner. More specifically, the results show a significant positive relationship between all of the four determinants of rural consumers' attitude toward the use of e-commerce, i.e., perceived quality of training service ($b = 0.302$, $p < 0.01$), perceived quality of logistics service ($b = 0.253$, $p < 0.01$), the degree of subjective norms ($b = 0.238$, $p < 0.01$), the degree of self-efficiency sense ($b = 0.209$, $p < 0.01$), and the attitude of rural consumers toward the use of e-commerce in China. Therefore, these results indicate that the perceived quality of logistics and training services, and the degree of both subjective norms and self-efficiency sense of rural consumers, as hypothesized, are key determinants of their attitude toward the use of e-commerce. These results thus provide strong support for Hypotheses 1–4. The effect size (f^2) of each independent variable was also examined and the results demonstrated that the effect sizes of the four significant determinants of attitude range from 0.08 to 0.15, suggesting that the effect sizes in this study are moderate.

Furthermore, Hypotheses 5a–5d were tested by examining the possible role of the perceived degree of the engagement in CSR by e-commerce firms in moderating the relationship between the four drives of consumer attitude (i.e., perceived quality of training and logistics services, subjective norms, and self-efficiency sense) and rural consumers' attitude toward the use of e-commerce. As reported in Figure 2, the path coefficients of the interaction terms between the perceived quality of training service ($b = 0.040$, $p < 0.05$), logistics service ($b = 0.062$, $p < 0.01$), the degree of consumer subjective norms ($b = 0.031$, $p < 0.05$), and the perceived level of the engagement in CSR by e-commerce players are positive and statistically significant, respectively. These results indicate that rural consumers who perceive higher quality of training or logistics service and display a tendency of a relatively larger degree of subjective norms are likely to have a positive attitude toward the use of e-commerce when e-commerce players are perceived to engage more in CSR activities. On the basis of these results, Hypotheses 5a–5c are strongly supported. However, as shown in Figure 2, the coefficient for the interaction of rural consumers' self-efficiency sense and the degree of perceived CSR by e-commerce players is not significant. Therefore, Hypothesis 5d is not supported.

Finally, this study examined the contribution of rural consumers' attitude toward the use of e-commerce to their willingness to engage in WOM. As shown in Figure 2, the

path coefficients from consumer attitude to the willingness to engage in WOM is strongly significant and in the predicted positive direction ($b = 0.753$, $p < 0.001$), thereby providing strong support for Hypothesis 6. This result implies that rural consumers in China who have a positive attitude toward the use of e-commerce are more willing to promote the adoption of e-commerce by engaging in WOM. In the following section, these results and their implications were discussed.

As a check on the robustness of the SEM results, both regression analyses and SEM analyses with Amos approach were performed to verify the hypothetical relationships of the study. The findings of the regression analyses and the SEM analyses using Amos are effectively equivalent to our results achieved from the use of the PLS SEM estimation, providing strong support for our main results.

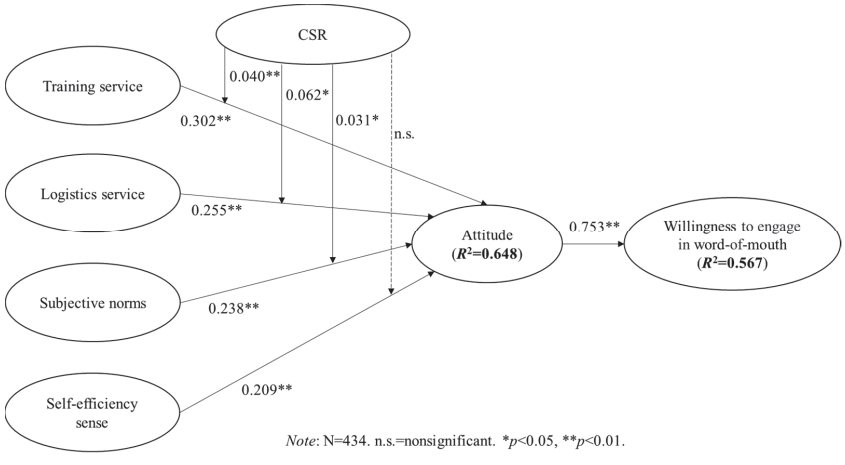

Figure 2. Estimated results of the hypothesis tests using a structural equation modeling.

5. Discussion and Implications

5.1. Theoretical Implications

This study, which takes ELM as its theoretical basis, combines the characteristics of e-commerce poverty alleviation. In poverty-stricken areas, many local villagers choose to go out to work. Thus, this study focuses on a unique group of rural consumers: rear personnel, young and middle-aged women, children, and the elderly who stay in poverty-stricken areas. At first, through a series of in-depth qualitative interviews employed before the quantitative analyses of the impact of various factors on the attitude of rural consumers toward e-commerce, this study identifies the major factors predicting these rural consumers' attitudes toward e-commerce platforms. Then, the central and peripheral routes affecting their attitudes were combed through a questionnaire survey. The central route includes training and logistics services. The peripheral route has subjective norms and self-efficiency sense.

This study explores the factors driving the positive attitude of rural consumers toward ecommerce use in poverty-stricken areas, which enhances these consumers' willingness to help e-commerce firms promote e-commerce services and platforms by engaging in WOM. This study reveals that the improvement of the perceived quality of training and logistics by ecommerce firms positively affects rural consumers' attitudes toward e-commerce use. Furthermore, subjective norms and the self-efficiency sense of rural consumers positively impact consumers' attitudes toward e-commerce use. Our study demonstrates that CSR plays a positive moderating role in shaping the relationships between quality training and logistics, subjective norms, and rural consumers' attitudes toward e-commerce use. Finally, the study finds that rural consumers who have a positive attitude toward e-commerce use

become more willing to engage more in WOM by recommending e-commerce platforms to their relatives, friends, and surrounding people.

This study offers important contributions to the literature by extending the application scope of ELM theory. ELM theory can be applied to e-commerce poverty alleviation to persuade rural consumers to use e-commerce. Building on the original framework, this study adds two crucial factors: CSR and the willingness to engage in WOM. More specifically, this study considers the intention of rural consumers to engage in WOM, the dependent variable of ELM, proving that positive attitudes toward e-commerce use will encourage rural consumers to engage in more WOM. In other words, rural consumers who have a positive attitude toward e-commerce are more willing to engage in WOM by recommending other consumers to use e-commerce. This finding contradicts the result found in the literature that WOM plays a vital role in predicting attitude and behaviors [108,109]. Thus, it provides a theoretical basis for the formulation and implementation of e-commerce poverty alleviation policies and extends the application of the theoretical framework of ELM, which provides important implications for future studies.

Furthermore, there is a growing consensus that firms should undertake CSR activities for a long time. However, the questions of why firms should engage more in CSR activities and, more importantly, how they undertake CSR activities, are relatively unclear. CSR has been argued to influence firm reputation and performance [52], customers' behavioral intention [54], and satisfaction [55]. This study finds that CSR can play a critical role in positively moderating training and logistics contributions and subjective norms to rural consumers' attitudes toward e-commerce use. In doing so, this study contributes to the CSR literature by demonstrating the urgency and necessity of firms to engage more in CSR activities and understanding better the specific direction for e-commerce firms to promote additional investment in CSR. Our study extends the logic of ELM and combining the recent development of CSR to derive theoretically driven contingencies on rural consumers' attitudes toward e-commerce use. Thus, our study provides a fine-grained analysis and framework that can be used to determine rural consumers' attitudes toward e-commerce use and precisely assess the effect of such attitudes on the intention of rural consumers to engage more in WOM.

5.2. Practical Implications

The findings of our study also offer several important implications for practitioners. First, the perceived quality of the training and logistics services of e-commerce is found to positively predict the attitude of rural consumers toward e-commerce use. Therefore, to encourage rural consumers to form positive attitudes and readily accept e-commerce use, ecommerce firms should provide good and practical training opportunities in poverty-stricken areas. Such a training program can significantly enhance rural consumers' understanding of ecommerce and improve rural consumers' e-commerce operation capability. In other words, the perceived quality of e-commerce training service offered by e-commerce firms can be considered one of the key factors determining their success in expanding their e-commerce business to rural areas and participating in e-commerce poverty alleviation [29,30]. This result is generally consistent with the prior literature, demonstrating that improving the training service quality can facilitate customers to produce more positive emotional responses [18,19]. Once the rural consumers form a positive attitude toward e-commerce use, they will become an important group of stakeholders for e-commerce firms and play a critical role in helping ecommerce firms expand their business in the region [57].

The perceived quality of logistics service is also found to positively affect the attitude of rural consumers toward e-commerce use. This finding naturally dovetails with previous studies that argue for logistics services' importance in directly affecting performance [30] and customer satisfaction [36,37]. In other words, when rural consumers form attitudes toward the use of e-commerce platforms, they tend to consider whether the logistics service or infrastructures in their areas can keep up or not. Only when the logistics corridor

is unobstructed in poverty-stricken areas can rural consumers understand and predict the possibility and potential of e-commerce development in the region. Building on this logic and empirical finding, this study suggests that e-commerce firms continuously accelerate their efforts to improve and enhance logistics service in rural areas, especially in poverty-stricken areas. Our field interviews and empirical results indicate that the overall development of China's logistics industry is still relatively underdeveloped. Therefore, problems of unbalanced and insufficient logistics service development and improvement are still prominent. As a result, the logistics service quality needs to be further improved and optimized, particularly logistics infrastructure in poverty-stricken areas.

Furthermore, subjective norms and rural customers' self-efficiency sense positively impact the attitudes toward e-commerce use. Rural consumers, more specifically, rear personnel, are a special, yet vulnerable, group of consumers. Their attitudes toward a business or service are usually more affected by their neighbors, relatives, and friends. They prioritize survival and thus tend to ignore new things. E-commerce is still new to many rural consumers. Thus, e-commerce firms must change the attitude of the people surrounding rural consumers toward e-commerce use if they plan to change the negative attitudes of their target rural consumers toward e-commerce use. This argument is based on the assumption that changing the attitudes of people surrounding the target rural consumers can indirectly exert substantial influence on the target rural consumers' attitude toward e-commerce use.

In addition, the empirical finding from this study also verifies the importance of rural consumers' self-efficiency sense in shaping their attitudes toward e-commerce use. Just as everything ultimately depends on oneself, self-efficiency sense refers to a degree of confidence of a person that he can complete a task. For example, even if rural consumers with low self-efficiency sense know how to use e-commerce, they may not be competent and confident in their e-commerce operating skills, resulting in negative attitudes toward e-commerce use. On the contrary, consumers with a high degree of self-efficiency sense are likely to have a positive attitude toward e-commerce use when they receive guidance in using e-commerce. Such guidance makes them believe they can be competent in doing e-commerce. As a result, rural consumers with a high self-efficiency sense are expected to understand how to deal with their pressures or challenges in e-commerce use, form positive attitudes, and finally take great efforts to learn and try new things, such as e-commerce [110–112].

Lastly, the results of our study offer additional evidence to confirm the assumption that e-commerce firms' engagement in CSR activities plays a positive moderating effect on the relationships between training and logistics services, subjective norms, and the attitude of rural consumers toward e-commerce use. Our findings suggest that e-commerce firms should engage in more CSR activities when they aim to expand their business or service in relatively poverty-stricken areas. Such CSR engagement can meet their practical requirements and improve ecommerce service quality. Subsequently, rural consumers would realize that some pressure stemmed from their subjective norms. They would easily form positive attitudes or change their negative ones and actively engage in e-commerce use.

This study did not find a significant moderating effect of the CSR engagement on the contribution of rural consumers' self-efficiency sense to their attitude toward e-commerce use. The reason may be that many rural consumers are elderly, women, and children. They generally have less contact with the outside world and are distant from e-commerce firms. E-commerce firms may be willing to engage in more CSR activities. However, such efforts may not significantly moderate the contribution of rural consumers' self-efficiency sense to the attitude of these rural consumers toward e-commerce use given their low self-confidence in using new things. Ecommerce firms should strengthen cooperation with respective local governmental agencies or institutions and make substantial efforts to exert their influence in poverty-stricken areas.

More importantly, local governments in these areas should also actively guide e-commerce firms to engage more in various programs of poverty alleviation and revi-

talization to encourage e-commerce firms to devote more resources to CSR activities in poverty-stricken areas. E-commerce firms in poverty-stricken areas will enhance their reputation when rural consumers in these regions have positive attitudes toward e-commerce use. Such attitudes help e-commerce firms achieve a better promotion effect through the relevant and effective impact of WOM, bring many rural migrant workers back home, and encourage them to start new businesses.

5.3. Limitations and Future Research Avenues

This study is not without its limitations, which we believe may provide fruitful avenues for future research. First, given the data constraints, this study examined the framework using a sample of rural consumers in a limited number of poor counties. Our study thus could not empirically verify our conceptual framework in all poverty-stricken areas. Researchers are encouraged to extend our study by examining our research questions and framework using a sample of rural consumers in other poverty-stricken areas. This study focused on the factors determining the attitude and willingness to engage in WOM of rural consumers in China, the largest emerging economy in the world. Future research may fruitfully extend our study to other countries and examine what shapes consumer attitudes toward specific service or products, such as local food, or even different distribution channels for purchasing or promoting such services or products [113,114], as well as WOM engagement in other economies. For example, emerging economies may be vastly different from advanced economies in terms of industrial policies, poverty alleviation efforts, poverty alleviation objects, and poverty alleviation conditions within or across various regions in the country. Employing comparative research, examining the determinants of attitude and WOM engagement between emerging and advanced economies or across emerging economies, and linking such differences to the differential levels of factors of service and consumer-specific characteristics in these economies would be interesting [113–115]. Lastly, given that some rural areas are still in an early stage of e-commerce poverty alleviation, many efforts of e-commerce firms need some time to be effectively implemented and put into action. The predominance of e-commerce poverty alleviation would also need some time. Future studies should adopt longitudinal data or experimental designs to consider the dynamics between resources and efforts devoted by ecommerce firms, government involvement, and consumer attitude and behavior change, which would be a fruitful avenue for future research. Overall, we believe that this study may provide new insights into how to predict consumer attitude and behaviors in e-commerce firms' capability to improve training and logistics services and better understand their rural consumers in rapidly emerging economies.

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Abbreviations

CMV	Common Method Variance
CSR	Corporate Social Responsibility
ELM	Elaboration Likelihood Model
SEM	Structural Equation Modeling
WOM	Word-of-Mouth

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Maturity Models and Sustainable Indicators—A New Relationship

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Abstract: This study aims to investigate the relationship between maturity models adopted by information technology companies and the sustainability indicators that are currently considered decision-making factors for investors and customers. The research is based on previous studies, Control Objectives for Information and Related Technology (COBIT), and Global Reporting Initiative (GRI) standards, and indicators of the Sustainable Development Goals (SDG) defined in 2015 by the United Nations. As a result of the intersection between the GRI and SDG indicators with COBIT requirements, a set of 50 indicators covering four dimensions of sustainability was identified. In the environmental dimension, 11 indicators were identified, in the economic dimension six indicators, in social dimension 14 indicators, and, at last, in the governance dimension, there were 19 convergent indicators between COBIT and GRI. This set of 50 proposed indicators was validated by analyzing the content of the sustainability reports available on the websites of information technology companies, making it possible to relate the sustainable practices and strategies adopted by such companies with the indicators suggested in this study. Furthermore, we identified that the SDGs are incorporated into the strategic objectives of seven of the nine companies analyzed.

Keywords: governance indicators; information technology; maturity models; SME; software; sustainability indicators

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1. Introduction

In a competitive and highly connected world, technology companies play a key role as providers of solutions and services [1]. As a result of the restrictions imposed by the pandemic, these companies have seen their economic value increase, almost in proportion to the pressure from stakeholders and society for greater transparency in data management, ethics, and socioenvironmental responsibility [2].

To face these pressures, the adoption of strategic and operational management models aligned with sustainability, and the establishment of measurable goals through indicators that show the materiality of the operations, have become indispensable tools [3].

Indicators are generally implemented as a measure to assess a company in relation to the quality of its services and/or products, operational or financial performance, customer, employee, or stakeholder satisfaction, and are also used to assess the level of sustainability of a company, city, or country [4]. In the field of sustainability, several indicators have been proposed, but, according to [5], the set of variables used to compose these indicators, such as the Environmental Sustainability Index (ESI), Environmental Performance Index (EPI), Adjusted Net Economy (ANS), and the Ecological Footprint, present conflicting or contradictory results.

In view of this scenario, Agenda 21 was proposed, which reinforced the need to establish indicators that allow the sustainable development of the millennium to be assessed, giving rise to the Sustainable Development Goals (SDGs) which are presented as relevant, measurable, easily communicated, accessible indicators, and with a focus on results [6]. However, the metrics proposed in Agenda 21 do not always meet corporate objectives, generating the need for a new set of indicators that assess sustainability in companies.

In the software engineering environment, the steps to determine the metrics can be oriented towards product evaluation—product inspection and quality control; process—evolution of the life cycle and management of activities at the operational level and system management—guarantee of product quality and technical information [7–9]. Another mechanism adopted is the maturity model that supports the development and control of processes, the optimization of established procedures, and also an improvement in product quality and the management of related activities, promoting the best use of available resources [10].

The optimization of resources can also be measured through annual or biennial sustainability and/or social responsibility reports, in which companies inform the results of their performance indicators and describe voluntary or mandatory actions to improve environmental, economic, and social performance operations [11]. This information, which started with the Corporate Social Responsibility (CSR) approach, has gained new outlines and has recently come to be known as Environmental Social and Governance (ESG) criteria, making social and environmental issues an indispensable part of companies' strategy [2,12].

One of the most adopted models to develop the Sustainability Report in companies is the Global Reporting Initiative (GRI), which uses inventory processes as a basis for data collection. This standardized model provides an overview of an organization's sustainable practices for investors, customers, employees, and stakeholders [11,13].

In software and information and communication technology (ICT) companies, the preparation and dissemination of sustainability reports has become a practice adopted by large companies or global organizations; however, among Brazilian micro and small software companies, which represent 95.5% of a total of 5924 companies in the sector, the dissemination of sustainable actions and practices has not yet occurred due to difficulties in implementing and measuring sustainability indicators [14,15].

Thus, this study has a main objective to develop a set of sustainable indicators that can be adopted by micro and small software companies, based on the connection between the sustainability indicators proposed by SGD and GRI, and the requirements of the COBIT maturity model. This set of indicators can help micro and small companies to assess their level of adherence to sustainability and identify points that need improvement.

After this introduction, Section 2 presents the theoretical framework that supports this study, which includes sustainable indicators, GRI, SDG, COBIT, and IT governance. Section 3 describes the research method carried out in this study. In Section 4, the analysis of sustainability indicators related to the requirements of the maturity model is presented, and the results obtained with this relationship are presented, which were based on the description of the application, of each item, of the analyzed requirements and indicators. Finally, Section 5 brings the final discussions and conclusions.

2. Materials and Methods

This study uses exploratory research as a method. For this purpose, research was carried out in the academic databases of Web of Science, IEEE, Scopus, and Google Scholar, in order to identify related works that address the theme of sustainability, COBIT maturity models, sustainable indicators in ICT, and IT governance, to compose a reliable theoretical basis, eliminating the subjectivity of researchers and providing subsidies for the elaboration of the proposed theoretical model. The updated versions of COBIT 2019, GRI-GSSB, and the SDGs and their targets were also analyzed [16,17].

Data collection performed for this study relied on electronic searches on the websites of the largest information technology companies that publish sustainability reports and adopt maturity models as one of the management and assessment tools for their operations. To analyze this dataset, the summative content analysis method was applied, which involves counting and comparisons, using the content, followed by the interpretation of the context related to the reporting patterns used [18].

3. Theorical Framework

This section aims to present the literature reviews and research that will support the proposed study, the structures used in the dissemination of sustainable practices, the goals to achieve the objectives of sustainable development, and the models of corporate maturity.

3.1. Indicators

The need to establish sustainable indicators emerged when Agenda 21 was drawn up, as it became imperative to investigate and outline the measures adopted by several countries to achieve sustainability and the well-being of the population; therefore, the use of relevant and globally applicable indicators proved to be fundamental for a global sustainability assessment [19].

An indicator can be understood as a "parameter that points out, provides information about, or describes the state of a phenomenon with relevance and importance for performance objectives". Metrics means "a measurable amount to track one or more indicators". In order to assess sustainability in the production process to verify material consumption, energy use, waste generation, and related manufacturing processes, indicators are created, and sustainable targets are established [20].

The sustainability indicators originally proposed by [21] were implemented in the life cycle analysis and were organized into three criteria: usability, relevance, and robustness of the related method. These indicators were grouped into hierarchical levels, starting with level 1 (sustainability footprint), level 2 (best practices), and level 3 (comprehensive assessment); building a set of indicators for assessing the sustainability of the product's life cycle [22] proposed 16 indicators to assess the sustainability of manufacturing companies considering four dimensions—environmental, economic, social, and governance.

In the case of ICT infrastructure, energy consumption in data centers is one of the biggest costs of its operation [17]. For this reason, the establishment of goals for the management of consumption and acquisition of energy from renewable sources, the use of energy-efficient equipment, and the adoption of intelligent cooling systems led to the creation of the Silicon Valley Commission (CA-USA), which established goals for the control and management of these resources in data centers [23].

Likewise, ecological and sustainable software is designed, from the beginning, to improve the use of energy and other natural resources, whether at the stage of development, implementation, use and/or storage, promoting the analysis of the life cycle process of the software [24,25].

3.2. Sustainability Report (GRI)

The Global Sustainability Standards Board (GSSB) is the agent responsible for preparing the set of standards with which organizations provide information on environmental, economic, and social impacts, positive or negative, considering the goals of sustainable operation and sustainable development programs. Being a globally accepted and recognized model, sustainability reports generated using the Global Reporting Initiative (GRI) set of standards allow you to compare business results, highlight transparency, promote accountability for organizations, and allow external and internal stakeholders to make decisions about investments, relationships, or business partnerships [26].

In sustainability reports based on GRI standards, materiality (all "significant impacts" arising from the activities carried out by the company that might concern an expert's community or that have been detected by causing any impact or life cycle assessments, requiring management and/or active involvement of the organization, should be reported) is the determining principle for defining which items are strategically relevant and, therefore, be part of them. It should also be noted that materiality assessments must meet the expectations expressed in the international standards and agreements established by the company [12]. In this sense, it is observed that the evolution of materiality for environmental, social, and governance (ESG) data appears as a response to investors' expectations

so that these data can be compiled, enabling financial risk assessments, in addition to materiality [27,28].

When preparing the report according to the GRI standards, companies must choose the main (core) version that contains the main elements, focusing on the process of identifying aspects (those that reflect economic, social, and environmental effects) or a comprehensive version, which, in addition to meeting the items in the essential version, adds information on strategy, analysis, governance, ethics, and integrity, in addition to reporting broadly the indicators regarding the material aspects identified [27].

3.3. Sustainable Development Goals (SDG)

The Sustainable Development Goals (SDGs) comprise the 2030 Agenda established by the United Nations Summit in September 2015, in New York (USA) with the eradication of poverty in all its forms, gender equity, aggregating them in the three dimensions of sustainability as the main focus [29]. The 2030 Agenda presents these guidelines through 17 objectives and 169 goals that address social, environmental, economic, and institutional issues, constituting a set of indicators that make it possible to monitor progress and ensure everyone's engagement [30].

These objectives were designed to complete the Millennium Development Goals, proposed in Agenda 21, and seek to guide the actions of governments, organizations, and civil society in areas critical to humanity and the planet, involving people, the planet, prosperity, peace, and the global partnership for sustainable development [6].

The 17 objectives for sustainable development proposed by the UN Commission are as follows:

> "1—End poverty in all its forms everywhere. 2—Zero Hunger. End hungers achieve food security and improved nutrition and promote sustainable agriculture. 3—Ensure a healthy life and promote well-being for all at all ages. 4—Ensure inclusive and equitable education and promote lifelong learning opportunities for all. 5—Achieve gender equality and empower all women and girls. 6—Ensure availability and sustainable management of water and sanitation for all. 7—Ensure access to affordable, reliable, sustainable, and modern energy for all. 8—Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all, 9—Build resilient infrastructure, promote sustainable and inclusive industrialization and foster innovation. 10—Reduce inequality within and among countries. 11—Make cities and human settlements inclusive, safe, resilient, and sustainable. 12—Ensure sustainable consumption and production patterns. 13—Take urgent action to combat climate change and its impacts. 14—Conserve and sustainably use the oceans, seas, and marine resources for sustainable development. 15—Protect, restore, and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss. 16—Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable, and inclusive institutions at all levels. 17—Strengthen the means of implementation and revitalize the global partnership for sustainable development." (Obtained in 18 August 2021 from https://un.org/sustainabledevelopment/).

The adoption of the Sustainable Development Goals by the countries of South America is based on the most emerging needs, generally related to zero hunger, housing and sanitation, and emission control of greenhouse gases (GHG) arising mainly from deforestation. These countries face great difficulties in following all the objectives determined in Agenda 2030, since this Agenda considers that governments are the majority in decisions and must adapt their internal development goals to the main objectives proposed in Agenda 2030 [31].

On the other hand, Latin American companies have shown an interest in the management and disclosure of sustainability actions, especially as there is a strong tendency among investors to allocate resources to companies that disclose ESG reports [12]. It was

also observed that companies with a diversified board of directors and with CEOs whose goal is sustainability, the disclosure of impact data related to ESG will be made public [12].

3.4. Maturity Models and Information Technology Governance

Among the maturity models adopted by software companies, Capability Maturity Model Integration (CMMI), Control Objectives for Information and Related Technology (COBIT), and Information Technology Infrastructure Library (ITIL) stand out [32]. They concentrate the largest adhesion of companies due to their practical application in management, control, and guidance of best practices in the software and information technology sector [33]. In publicly traded companies, since the establishment of the Sarbanes–Oxley (SOX) law, the disclosure of internal controls over activities developed internally or externally in the information technology area and the security processes involving company data have become part of the corporate governance, with COBIT as the most used model [34].

- COBIT Structure

COBIT is a model for the governance and management of a company's information technology. It is implemented in organizations as a tool to measure the achievement of the objectives of improving the quality of the process, as well as standardizing the activities carried out and improving governance initiatives.

The structure of COBIT 2019 has two dimensions, one for governance and another for management, and 40 management objectives distributed in five domains, integrating design factors and focus areas as indicated in the COBIT guidelines, created by the Association of Control and Audit Systems Information—ISACA. In the most recent version, it also aligns the maturity levels from 0 to 5 with the CMMI, enabling the ability to execute all processes successfully and promoting the ongoing progress of IT management and governance [35].

COBIT is considered one of the most used models to manage, control, and guarantee the best practices of information technology (IT), and incorporates the standards of ISO/IEC20000, ISO/IEC 27000, and ISO/IEC 38500 and alignment with models such as ITIL and CMMI, in addition to being an important determining factor for the disclosure of information on IT governance in annual reports [36].

- IT Governance

IT governance is a set of mechanisms that control the balance of activities and the appropriate use of resources, by which leaders perform the functions of representation, regulation, service provision, and formulation of public policies, integrating the various IT actors [37,38].

Corporate governance can be described as a set of activities that include authority, control, accountability, definition of functions, and responsibilities aiming at the transparency of operations, and it requires top management to transparently disclose information and results of operations to the board, shareholders, stakeholders, and employees [39–41].

IT governance (ITG) can be defined as the organizational capacity exercised by the board of directors, senior managers, and IT managers in the elaboration of strategies and controls for information technology activities, so that they remain aligned with the business strategy [37,42].

The mechanisms that make up IT governance can contribute to increased organizational performance and efficiency, as they help to reduce infrastructure costs through the appropriate use of resources [39]. When the organization includes people management resources for managing IT resources (automate, computerize, transform, and infrastructure), it reveals the possibility of developing these resources with a sustainable bias [43,44].

4. Results

In this section, we present the results of the comparative analyses between the SDG indicators and GRI-GSSB items with the requirements of COBIT 2019, considering that the objective of this study is to develop a set of indicators that enable the sustainability data records of micro and small software companies. The analyses of the sustainability

and/or social responsibility reports prepared and made available by nine global technology companies are presented, aiming to validate the adherence of the proposed set of indicators with the indicators used by these companies. This validation was carried out because micro and small companies do not yet practice the dissemination of their sustainable actions.

4.1. Convergence among Sustainability Indicator Standards (GRI, SDG, COBIT)

Taking, as a guideline, the 17 SDGs and the 169 related goals, a comparative content analysis was carried out to outline similarities between the SDG and the GRI-GSSB 141 report items, prioritizing the indicators used in the software industry. After the end of this comparison, the 232 requirements of COBIT 2019 were analyzed to identify the adherence of these objectives to the ODS indicators and the GRI-GSSB items, generating a set of 50 indicators and/or items.

These 50 identified indicators (see Table 1) have similarities and/or convergence with each other, and are grouped within the four dimensions of sustainability, as shown below.

Table 1. Convergence among GRI and SDG and COBIT2019 indicators.

Dimension Indicator	Global Reporting Initiative (GSSB)	Sustainable Development Goals (Targets Associated)	COBIT 2019 (Governance and Management Objectives)
GVN1	102-11 => Precautionary Principle or approach		EDM02.01 Establish the target investment mix; MEA02.02 Review effectiveness of business process controls.
GVN2	102-15 => Key impacts, risks, and opportunities		EDM03.01 Evaluate risk management; EDM03.02 Direct risk management.
GVN3	102-16 => Values, principles, standards, and norms of behavior	**16.3** Promote the rule of law at the national and international levels and ensure equal access to justice for all.	MEA04.01 Ensure that assurance providers are independent and qualified.
GVN4	102-17 => Mechanisms for advice and concerns about ethics	**16.3**	MEA04.01 Ensure that assurance providers are independent and qualified.
GVN5	102-18 => Governance structure		APO01.01 Design the management system for enterprise I&T; APO01.04 Define and implement the organizational structures; EDM01.02 Direct the governance system.
GVN6	102-19 => Delegating authority		APO01.01 Design the management system for enterprise I&T; APO01.05 Establish roles and responsibilities; EDM01.01 Evaluate the governance system.
GVN7	102-21 => Consulting stakeholders on economic, environmental, and social topics	**16.7** Ensure responsive, inclusive, participatory, and representative decision-making at all levels	APO02.05 Define the strategic plan and road map; APO02.06 Communicate the I&T strategy and direction; BAI01.03 Manage stakeholder engagement; EDM01.01 Evaluate the governance system.
GVN8	102-26 => Role of highest governance body in setting purpose, values, and strategy		APO01.09 Define and communicate policies and procedures.
GVN9	102-28 => Evaluating the highest governance body's performance		EDM01.03 Monitor the governance system.

Table 1. *Cont.*

Dimension Indicator	Global Reporting Initiative (GSSB)	Sustainable Development Goals (Targets Associated)	COBIT 2019 (Governance and Management Objectives)
GVN10	102-29 => Identifying and managing economic, environmental, and social impacts	**16.7**	EDM02.01 Establish the target investment mix.
GVN11	102-30 => Effectiveness of risk management processes		APO01.11 Manage continual improvement of the I&T management system; APO12.02 Analyze risk; EDM01.03 Monitor the governance system; EDM03.02 Direct risk management.
GVN12	102-31 => Review of economic, environmental, and social topics		EDM02.03 Direct value optimization; EDM03.03 Monitor risk management; MEA03.01 Identify external compliance requirements.
GVN13	102-40 => List of stakeholder groups		MEA01.01 Establish a monitoring approach.
GVN14	102-42 => Identifying and selecting stakeholders		MEA01.01 Establish a monitoring approach.
GVN15	102-43 => Approach to stakeholder engagement		BAI11.03 Manage stakeholder engagement; MEA01.02 Set performance and conformance targets; MEA03.01 Identify external compliance requirements; EDM05.01 Evaluate stakeholder engagement and reporting requirements.
GVN16	102-44 => Key topics and concerns raised		EDM05.03 Monitor stakeholder engagement.
GVN17	103-1 => Explanation of the material topic and its Boundary		APO01.02 Communicate management objectives, direction and decisions made; EDM04.02 Direct resource management.
GVN18	103-2 => The management approach and its components		EDM04.03 Monitor resource management.
GVN19	103-3 => Evaluation of the management approach		APO01.03 Implement management processes (to support the achievement of governance and management objectives); EDM02.02 Evaluate value optimization; EDM04.01 Evaluate resource management.

Table 1. *Cont.*

Dimension Indicator	Global Reporting Initiative (GSSB)	Sustainable Development Goals (Targets Associated)	COBIT 2019 (Governance and Management Objectives)
ECN1	201-1 => Direct economic value generated and distributed	**1.2** By 2030, reduce at least by half the proportion of men, women, and children of all ages living in poverty in all its dimensions according to national definitions. **8.1** Sustain per capita economic growth in accordance with national circumstances and, in particular, at least 7 per cent gross domestic product growth per annum in the least-developed countries. **8.2** Achieve higher levels of economic productivity through diversification, technological upgrading, and innovation, including through a focus on high-value added and labor-intensive sectors. **9.1** Develop quality, reliable, sustainable, and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all. **9.4** By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities. **9.5** Enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, in particular developing countries, including, by 2030, encouraging innovation and substantially increasing the number of research and development workers per 1 million people and public and private research and development spending.	APO06.01 Manage finance and accounting.
ECN2	201-2 => Financial implications and other risks and opportunities due to climate change	**13.1** Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries.	DSS01.04 Manage the environment; EDM03.01 Evaluate risk management.
ECN3	203-1 => Infrastructure investments and services supported	**5.4** Recognize and value unpaid care and domestic work through the provision of public services, infrastructure. and social protection policies and the promotion of shared responsibility within the household and the family as nationally appropriate. **9.1**; **9.4**; **11.2** By 2030, provide access to safe, affordable, accessible, and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention paid to the needs of those in vulnerable situations, women, children, persons with disabilities, and older persons.	APO04.02 Maintain an understanding of the enterprise environment. EDM02.02 Evaluate value optimization. EDM02.04 Monitor value optimization.

Table 1. *Cont.*

Dimension Indicator	Global Reporting Initiative (GSSB)	Sustainable Development Goals (Targets Associated)	COBIT 2019 (Governance and Management Objectives)
ECN4	203-2 => Significant indirect economic impacts	**1.2**; **1.4** By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership, and control over land and other forms of property, inheritance, natural resources, appropriate new technology, and financial services, including microfinance. **3.8** Achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality, and affordable essential medicines and vaccines for all. **8.2**; **8.3** Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity, and innovation, and encourage the formalization and growth of micro-, small-, and medium-sized enterprises, including through access to financial services. **8.5** By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value.	APO04.03 Monitor and scan the technology environment; APO04.06 Monitor the implementation and use of innovation; APO12.05 Define a risk management action portfolio; DSS04.02 Maintain business resilience.
ECN5	204-1 => Proportion of spending on local suppliers	**8.3**	APO05.02 Evaluate and select programs to fund; APO07.06 Manage contract staff.
ECN6	207-3 => Stakeholder engagement and management of concerns related to tax	**1.1** By 2030, eradicate extreme poverty for all people everywhere, currently measured as people living on less than USD 1.25 a day. **1.3** Implement nationally appropriate social protection systems and measures for all, including floors, and by 2030 achieve substantial coverage of the poor and the vulnerable. **10.4** Adopt policies, especially fiscal, wage, and social protection policies, and progressively achieve greater equality. **17.1** Strengthen domestic resource mobilization, including through international support to developing countries, to improve domestic capacity for tax and other revenue collection. **17.3** Mobilize additional financial resources for developing countries from multiple sources.	EDM05.02 Direct stakeholder engagement, communication and reporting.
EVR1	301-3 => Reclaimed products and their packaging materials	**8.4** Improve, progressively, through 2030, global resource efficiency in consumption and production and endeavor to decouple economic growth from environmental degradation, in accordance with the 10-year framework of programs on sustainable consumption and production, with developed countries taking the lead. **12.2** By 2030, achieve the sustainable management and efficient use of natural resources. **12.5** By 2030, substantially reduce waste generation through prevention, reduction, recycling, and reuse.	BAI09.03 Manage the asset life cycle.

Table 1. *Cont.*

Dimension Indicator	Global Reporting Initiative (GSSB)	Sustainable Development Goals (Targets Associated)	COBIT 2019 (Governance and Management Objectives)
EVR2	302-1 => Energy consumption within the organization	**7.2** By 2030, increase substantially the share of renewable energy in the global energy mix. **7.3** By 2030, double the global rate of improvement in energy efficiency. **8.4**; **12.2**; **12.5**; **13.1**	BAI04.01 Assess current availability, performance and capacity and create a baseline.
EVR3	302-3 => Energy intensity	**7.3**; **8.4**; **12.2**; **13.1**	BAI04.02 Assess business impact; DSS01.05 Manage facilities.
EVR4	302-4 => Reduction of energy consumption	**7.3**; **8.4**; **12.2**; **13.1**	BAI04.04 Monitor and review availability and capacity.
EVR5	302-5 => Reductions in energy requirements of products and services	**7.3**; **8.4**; **12.2**; **13.1**	BAI04.05 Investigate and address availability, performance and capacity issues.
EVR6	303-1 => Water withdrawal by source	**6.3** By 2030, improve water quality by reducing pollution, eliminating dumping, and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally. **6.4** By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity. **6.A** By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programs, including water harvesting, desalination, water efficiency, wastewater treatment, recycling, and reuse technologies. **6.B** Support and strengthen the participation of local communities in improving water and sanitation management. **12.4** By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water, and soil in order to minimize their adverse impacts on human health and the environment.	BAI04.04 Monitor and review availability and capacity.
EVR7	305-2 => Energy indirect (Scope 2) GHG emissions	**3.9** By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water, and soil pollution and contamination. **12.4**; **13.1** **14.3** Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels. **15.2** By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests, and substantially increase afforestation and reforestation globally.	DSS01.05 Manage facilities.

Table 1. *Cont.*

Dimension Indicator	Global Reporting Initiative (GSSB)	Sustainable Development Goals (Targets Associated)	COBIT 2019 (Governance and Management Objectives)
EVR8	305-5 => Reduction of GHG emissions	**13.1**; **14.3**; **15.2**	DSS01.05 Manage facilities.
EVR9	306-1 => Waste generation and significant waste-related impacts	**3.9**; **6.3**; **6.4**; **6.6** By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers, and lakes; **12.4**; **14.1**;	BAI09.03 Manage the asset life cycle.
EVR10	306-5 => Waste directed to disposal	**6.6**; **14.2** By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans. **15.1** By 2020, ensure the conservation, restoration, and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains, and drylands, in line with obligations under international agreements. **15.5** Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity, and, by 2020, protect and prevent the extinction of threatened species.	BAI09.03 Manage the asset life cycle.
EVR11	308-1 => New suppliers that were screened using environmental criteria		APO10.03 Manage vendor relationships and contracts.
SCL1	401-1 => New employee hires and employee turnover	**5.1** End all forms of discrimination against all women and girls everywhere. **8.5**; **10.3** Ensure equal opportunity and reduce inequalities of outcome, including by eliminating discriminatory laws, policies, and practices and promoting appropriate legislation, policies, and action in this regard.	APO07.01 Acquire and maintain adequate and appropriate staffing.
SCL2	402-1 => Minimum notice periods regarding operational changes	**8.8** Protect labor rights and promote safe and secure working environments for all workers, including migrant workers, in particular women migrants, and those in precarious employment.	APO07.02 Identify key IT personnel; BAI05.06 Embed new approaches; BAI06.01 Evaluate, prioritize and authorize change requests.
SCL3	403-5 => Worker training on occupational health and safety	**8.8**	DSS01.05 Manage facilities.

Table 1. *Cont.*

Dimension Indicator	Global Reporting Initiative (GSSB)	Sustainable Development Goals (Targets Associated)	COBIT 2019 (Governance and Management Objectives)
SCL4	404-1 => Average hours of training per year per employee	**4.3** By 2030, ensure equal access for all women and men to affordable and quality technical, vocational, and tertiary education, including university. **4.4** By 2030, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs, and entrepreneurship. **4.5** By 2030, eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples, and children in vulnerable situations. **5.1**; **8.2** Achieve higher levels of economic productivity through diversification, technological upgrading, and innovation, including through a focus on high-value added and labor-intensive sectors. **8.5** By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value. **10.3**	APO01.08 Define target skills and competencies; APO07.03 Maintain the skills and competencies of personnel; DSS04.06 Conduct continuity plan training.
SCL5	404-2 => Programs for upgrading employee skills and transition assistance programs	**8.2**; **8.5**	APO07.03 Maintain the skills and competencies of personnel.
SCL6	404-3 => Percentage of employees receiving regular performance and career development reviews	**5.1**; **8.5**; **10.3**	APO07.04 Assess and recognize/reward employee job performance.
SCL7	408-1 => Operations and suppliers at significant risk for incidents of child labor	**8.7** Take immediate and effective measures to eradicate forced labor, end modern slavery and human trafficking, and secure the prohibition and elimination of the worst forms of child labor, including recruitment and use of child soldiers, and by 2025, end child labor in all its forms. **16.2** End abuse, exploitation, trafficking, and all forms of violence against and torture of children.	APO10.04 Manage vendor risk.
SCL8	409-1 => Operations and suppliers at significant risk for incidents of forced or compulsory labor	**8.7**	APO10.04 Manage vendor risk.
SCL9	414-1 => New suppliers that were screened using social criteria	**5.2** Eliminate all forms of violence against all women and girls in the public and private spheres, including trafficking and sexual and other types of exploitation. **8.8**; **16.1** Significantly reduce all forms of violence and related death rates everywhere.	APO10.03 Manage vendor relationships and contracts.
SCL10	416-2 => Incidents of noncompliance concerning the health and safety impacts of products and services	**16.3**	APO13.03 Monitor and review the information security management system (ISMS).

Table 1. *Cont.*

Dimension Indicator	Global Reporting Initiative (GSSB)	Sustainable Development Goals (Targets Associated)	COBIT 2019 (Governance and Management Objectives)
SCL11	417-1 => Requirements for product and service information and labeling	**12.8**	APO14.02 Define and maintain a consistent business glossary. DSS01.02 Manage outsourced I&T services.
SCL12	417-2 => Incidents of noncompliance concerning product and service information and labeling	**16.3**	DSS01.01 Perform operational procedures.
SCL13	418-1 => Substantiated complaints concerning breaches of customer privacy and losses of customer data	**16.3**; **16.10**	APO13.01 Establish and maintain an information security management system (ISMS).
SCL14	419-1 => Noncompliance with laws and regulations in the social and economic area	**16.3**	MEA03.03 Confirm external compliance.

Legend: ECN: economic; EVR: environmental; GVN: governance; SCL: social.

Environmental dimension = 11 indicators

- The environmental indicators, comprising water consumption, CO_2 emissions, energy consumption, use of materials, and products and services, show convergence with seven items in the COBIT structure.
- The relationship with the following objectives was also observed: ODS3—good health and well-being, ODS6—clean water and sanitation, ODS7—affordable and clean energy, ODS8—decent work and economic growth, ODS12—responsible consumption and production, ODS13—climate action, ODS14—life below water, and ODS15—life on land.

Economic dimension = six indicators

- The economic indicators prepared by the subsets economic performance, indirect impacts, purchasing practices, and products highlight the similarity of content with 13 COBIT items.
- Regarding the SDGs, it was observed that the economic aspect found convergence in the SDG1—non-poverty, SDG3—health and well-being, SDG05—gender equality, SDG8—decent work and economic growth, SDG9—industry, innovation, and infrastructure, ODS10—reduce inequalities, ODS11—sustainable cities and communities, ODS13—climate action, and ODS17—partnerships for the goals.

Social dimension = 14 indicators

- The social indicators, represented by the subset labor practices, training, products, and society, are similar to 17 items of COBIT.
- In relation to the relationship with the SDGs, adherence to the objectives SDG4—quality education, SDG5—gender equity, SDG8—decent work and economic growth, SDG10—reduction of inequality within and between countries, SDG12—responsible consumption and production, and SDG16—peace, justice, and strong institutions.

Governance = 19 indicators

- The governance indicators represented by the strategy, ethics, and risk analysis subsets have similarities with 31 COBIT items.
- When observing the relationship of these indicators with the SDGs, their adherence to SDG16—peace, justice, and strong institutions was identified.

As a result of this analysis, among the 50 converging items identified in the comparative checks between COBIT, GRI, and SDGs, there were the governance indicators with 19 items, the social indicators with 14 similar items, followed by the environmental indicators with 11 similar items, and ending with the economic indicators with six items.

Referring to the above finding, there is greater adherence of environmental and social indicators to COBIT requirements, and, at the same time, this confirms the trends of the ESG approach recently adopted by companies, which is supported by the socioenvironmental and governance indicators developed and disclosed by some data analysis companies of risk/investments such as MSCI's Domini Social Index (DSI) and KDL400 Social Index, Morningstar's Sustainalytics, and Bloomberg's ESG which, monthly, release ESG risk assessments from more than 400 companies, including AT&T (Dallas, TX, USA), Dell (Austin, TX, USA), Facebook (Menlo Park, CA, USA), Google (Mountain View, CA, USA), IBM (Armonk, NY, USA), Microsoft (Redmond, WA, USA), and SAP (Walldorf, Germany).

Considering the possibilities of linking GRI reporting items, SDGs, and COBIT requirements and adopting the premise that GRI standards are adopted by software and IT companies, we sought to analyze whether sustainability in companies can be encouraged by adopting COBIT maturity models aligned with SDGs. As a result of the checklist presented above, it was found that of the 231 COBIT items, 99 belong to the APO and EDM domains, and that items in these domains total 43 of the 64 GRI and SDG indicators listed for this study.

4.2. Alignment between Corporate Sustainability Goals and SDG, COBIT, and GRI

Searches were conducted on the corporate websites of the largest global technology companies, such as Amazon (Seattle, WA, USA) [45], AT&T (Dallas, TX, USA) [46,47], Dell (Round Rock, TX, USA) [48], Equinix (Redwood City, CA, USA) [49], Facebook (Menlo Park, CA, USA) [50], Google (Mountain View, CA, USA) [51,52], IBM (Armonk, NY, USA) [53,54], Microsoft (Redmond, WA, USA) [55], Oracle (Austin, TX, USA) [56–58], PayPal (San Jose, CA, USA) [59], Salesforce (San Francisco, CA, USA) [60], SAP (Walldorf, Germany) [61], and Tata (Mumbai, India) [62] in order to obtain the sustainability data published by these organizations, in order to verify which indicators are used, to identify whether the sustainability indicators presented by these companies in their reports are adherent to the set of indicators developed by this study. The data obtained in the surveys and the comparison of indicators are presented in Table 2.

Among the sustainability reports of the companies above, it was observed that the reports of the companies Amazon (Bellevue, DC, USA), Facebook (Cambridge, MA, USA), and Google (Menlo Park, CA, USA) did not use the GRI standard, and the report of the company Salesforce does not provide the necessary indications to carry out the comparisons, which limited the analyses, making it impossible to include these companies in the process of verifying the use of the SDGs in the composition of sustainability reports and in the corporate strategy of the companies.

It was observed that the surveyed companies established sustainability goals related to climate change, the efficient use of energy and water, in the education of employees and the community, in sustainable innovation, in gender equity, and in good labor relations (See Table 2).

The objectives of sustainable development, defined by the UN in 2015, find in the corporate environment a strong ally, as can be seen in the sustainability reports analyzed in which the following SDGs are the strategic objectives of seven of the nine companies analyzed. The prioritized objectives are: SDG3 (good health and well-being), SDG4 (quality education), SDG5 (gender equality), SDG7 (affordable and clean energy), SDG8 (decent work and economic growth), SDG9 (industries, innovation, and infrastructure), SDG13 (climate action), and SDG17 (partnership for the goals). SDG12 (responsible consumption and production) is part of the strategy of companies that produce electronic devices.

Table 2. Alignment among corporate sustainability goals and SDG, COBIT, and GRI.

CIA	Goals and Objectives	SDGs Prioritized by Companies	Indicators Prioritized versus Proposed Indicators
AT&T	While we are focused on today's critical issues, we are maintaining our commitments to help tackle the ongoing climate emergency. AT&T has signed agreements surpassing 1.5 gigawatts of renewable energy capacity, making us one of the largest corporate purchasers in the U.S. To enhance the resiliency of our operations, our Climate Change Analysis Tool currently helps visualize climate-related risks to network infrastructure and operations in the southeastern U.S. up to 30 years into the future, and we are making the data sets we use available to external organizations conducting their own research.	AT&T purpose, to create connection—with each other, with what people need to thrive in everyday lives, and with the stories and experiences that matter, is aligned with the UN SDGs. The SDGs chosen as the focus of AT&T are: SDG3 GOOD HEALTH and WELL-BEING and Target 3.6; SDG4 QUALITY EDUCATION and Target 4.4. SDG5 GENDER EQUALITY and Target 5.1, 5.2, and 5.5 and 5.B. SDG8 DECENT WORK and ECONOMIC GROWTH and Target 8.4, 8.5, 8.6, 8.8. SDG9 INDUSTRY, INNOVATION, and INFRASTRUCTURE with Target 9.1, 9.4. SDG11 SUSTAINABLE CITIES and COMMUNITIES with Target 11.3, 11.6. SDG13 CLIMATE ACTION with Target 13.1, 13.3. SDG16 PEACE, JUSTICE and STRONG INSTITUTIONS with Target 16.2, 16.10, 16B, and SDG17 PARTNERSHIP FOR THE GOALS with Target 17.16 and 17.17	25 items GRI not found. 30 COBIT requirements not found. 9 SDGs chosen at company.
DELL	Global Environmental Policy—At Dell Technologies, we believe that we can be most successful as a sustainability-focused company by putting technology and expertise to work where they can do the most good for people and the planet. By setting science-based targets we are ensuring our own sustainability, as well as supporting the needs of businesses in the future. Our customers need to know we have their back and can help them reduce energy use in the long term. It has been an extremely useful process to go through: to understand the challenges and the potential technical solutions, to invest in the capability to measure progress, and of course, there are cost savings: if we can reduce the energy our products use, we benefit from that.	Considering the content of the Dell company's sustainability report, synergy with the following SDGs can be identified: SDG1-NO POVERETY; SDG3; SDG4; SDG5; SDG6-CLEAN WATER AND SANITATION (A,B); SDG7-AFFORDABLE AND CLEAN ENERGY; SDG8; SDG9; SDG10-REDUCE INEQUALITIES; SDG11; SDG12-RESPONSIBLE CONSUMPTION AND PRODUCTION; SDG13; SDG14-LIFE BELOW WATER; SDG15-LIFE ON LAND; SDG16; SDG17.	3 items GRI not found. 3 COBIT requirements not found. 16 SDGs identified.

Table 2. *Cont.*

CIA	Goals and Objectives	SDGs Prioritized by Companies	Indicators Prioritized versus Proposed Indicators
EQUINX	To further our #InServiceTo mindset, we are committed to protecting, connecting, and powering a more sustainable digital world. We are advancing a bold sustainability agenda and have made meaningful progress across our environmental, social and governance commitments. As a digital leader, we have the opportunity to harness the power of technology in order to create a more sustainable future. At Equinix, we are committed to protecting the planet, connecting everyone to the benefits of the digital world and powering global trust and responsibility. Our corporate sustainability program is comprised of our environment, social and governance (ESG) initiatives that focus on material issues to positively impact our key stakeholders.	Equinix, along with other companies, countries, and nongovernmental organizations (NGOs), has chosen to align our objectives with the United Nations Sustainable Development Goals (UN SDGs) in order to accelerate our collective progress on the world's most important social and environmental challenges. While all SDGs are important, we have prioritized our alignment with the six SDGs that we believe are the most material to our business. SDG5; SDG7; SDG8; SDG9; SDG10; and SDG13.	18 items GRI not found. 18 COBIT requirements not found. 6 SDGs prioritized.
IBM	IBM has a proud history of engagement with the communities where we operate, as well as societies globally. We share the priorities for social advancement that the 17 United Nations Sustainable Development Goals establish and endorse the strategy of partnership that the SDGs call for, because collaboration has long been IBM's approach to engaging societal challenges. IBM's efforts toward these goals can be seen in our environmental programs, supply chain practices, corporate social responsibility work, and our global focus on diversity and inclusion. We work with social organizations, governments, and commercial clients to develop many of these solutions—some of which you will find in this report, shown with the SDG that each initiative can help achieve.	Considering the content of the IBM company's sustainability report, synergy with the following SDGs can be identified: SDG1; SDG3; SDG4; SDG5; SDG6 (a,b); SDG7; SDG8; SDG9; SDG10; SDG11; SDG12; SDG13; SDG14; SDG15; SDG16; SDG17.	all GRI items found. all COBIT requirements found. 16 SDGs identified.

Table 2. *Cont.*

CIA	Goals and Objectives	SDGs Prioritized by Companies	Indicators Prioritized versus Proposed Indicators
MICROSOFT COMPANY	Over the past year, we built on this pledge by announcing a series of commitments to be water positive by 2030, zero waste by 2030, and to protect ecosystems by developing a Planetary Computer. We grounded our sustainability strategy and commitments in the belief that technology can help solve the world's biggest challenges. Whenever Microsoft takes on a new and complex societal issue, we strive first to learn and then to define a principled approach to guide our efforts. In 2020, we did the same with environmental sustainability. Definition of focus areas: We focus on four areas—carbon, water, waste, and ecosystems—where we can scale, minimizing the negative impacts of our operations and maximizing the positive impacts of our technology.	We are actively engaged in supporting the UN Sustainable Development Goals (SDGs) and publicly report how Microsoft contributes to the global effort to achieve them. At Microsoft, we have also reflected on three key pillars that most of our contributions stand on: empowering people, strengthening communities, and protecting the planet. These pillars correspond most closely to the following four Global Goals: SDG4, SDG8, SDG13, and SDG16. For the Microsoft Devices segment, SGD 3, 5, 6, 7, 12, 14, and 15 are established, in addition to the SGD defined as priorities for the Microsoft Company.	11 items GRI not found. 10 COBIT requirement not found. 4 SDGs prioritized.
ORACLE	Oracle recognizes that sustainability is good business. That is why we are committed to developing practices and products that enable our customers around the world to put the planet first. Operations—Sustainability is at the heart of our business operations—from managing our use of natural resources to ensuring responsible supply chain practices and running sustainable events globally. Oracle leads the way in designing sustainable world-class events for customers, partners, developers, and employees. Oracle is also a founding signatory to the Principles for Sustainable Events. Oracle OpenWorld—our largest annual customer technology conference—follows a process based on ISO 20121:2012 event sustainability management systems. Oracle creates event sustainability action plans that prioritize the four event sustainability goals: WASTE NOT (promote zero waste); BE COOLER (Model carbon reduction and responsibility for corporate events); GIVE BACK (Catalyze legacies to benefit host destinations) and HAVE FUN (Inspire attendees through engaging sustainability experiences).	We all share one planet and are one humanity. It is a truth both simple and profound, and one that drives our sustainability efforts at Oracle. Sustainability is inherent in the way we think about and approach nearly every aspect of our business, from operational efficiency to product development to employee engagement. There is always more work to be completed, and Oracle remains committed to building a resilient future for our planet, for humanity, and for future generations. Together we are changing lives around the world, and with the growth in new disruptive technologies, including the cloud, I am more hopeful now than ever before that we can achieve the Sustainable Development Goals necessary to benefit our planet and the life it sustains—SDG2-ZERO HUNGRE; SDG3; SDG4; SDG8; SDG13; SDG17.	13 items GRI not found. 13 COBIT requirement not found.

Table 2. *Cont.*

CIA	Goals and Objectives	SDGs Prioritized by Companies	Indicators Prioritized versus Proposed Indicators
PAYPAL	In 2019, we prioritized initiatives aligned with our mission and values and worked to integrate key ESG factors into the very fabric of our business. Throughout the year, we introduced new wellness and engagement programs for our employees, advanced our cross-sector social impact partnership strategy, expanded our capabilities to support charitable giving, advanced our thought leadership on financial health, and made further commitments to our communities and our planet. As part of our ESG materiality assessment, we also examined how our business activities and key priority areas align with the United Nations' Sustainable Development Goals (SDGs).	Overall, PayPal makes a direct, positive contribution to 10 of the 17 SDGs, with the greatest influence on the five goals listed below. Meanwhile, we remain focused on responsibly managing our operations and supporting our communities consistent with all of the Global Goals. SDG1 (Target 1.4); SDG8 (Target 8.5); SDG9 (Target 9.3); SDG10 (Target 10.C); SDG17 (Target 17.17). SDG4; SDG5; SDG3; SDG16; SDG6; SDG7, the company makes the statement in the report, but does not set clear objectives.	35 items GRI not found. 45 COBIT requirement not found.
SAP	At SAP, our purpose is to "help the world run better and improve people's lives" by empowering our customers to create a better economy, society, and environment for the world. In line with our purpose, we are committed to supporting the United Nations Sustainable Development Goals (UN SDGs). Technology-driven innovation underpins how SAP, together with our customers and our partner ecosystem, can execute initiatives across all 17 of the UN SDGs. Our goal is to lead the evolution of technology while also helping ensure that the focus remains on taking responsibility for its outcomes and societal effects. Examples of how we are carrying this out include the focus of social investments on building digital skills and our guiding principles for artificial intelligence and governance.	In assessing our impact on society through the SAP portfolio, our stakeholders identified seven SDGs as material: SDG9; SDG3; SDG8; SDG13; SDG17; SDG12; SDG4.	27 items GRI not found. 36 COBIT requirement not found. 6 SDG prioritized.

Table 2. *Cont.*

CIA	Goals and Objectives	SDGs Prioritized by Companies	Indicators Prioritized versus Proposed Indicators
TATA	TCS publishes the Sustainability Report on an annual basis. The last report was published for FY 2018. The current report, for FY 2019 (year ending 31 March 2019), is the 13th such report published by TCS till date. This report has been prepared in accordance with the GRI Standards: Core option. Our responsible sourcing program motivates our suppliers to adhere to 100% regulatory compliances and strive for better sustainability performance. Our Sustainable Supply Chain policy and Green Procurement policy outline our commitment to make our supply chain more responsible and sustainable. TCS' focus on resource use and waste reduction has led to the reduction of the consumption of the per capita paper consumption by 12.6% over the previous year and 87% over the baseline FY 2008. The success of this drive can be attributed to the awareness created among employees and the enforcement of printing discipline through automated and manual means.	Analyzing the sustainability report of TATA Consultancy Services (TCS), it was identified that the following SDGs are identified as the Company's priority, namely: SDG1, SDG3; SDG4; SDG5; SDG6; SDG7; SDG8; SDG9; SDG11; SDG12; SDG13; SDG14.	31 items GRI not found. 39 COBIT requirement not found. 12 ODS prioritized.

4.3. Proposed Indicators

Based on the analysis performed on the previous sections, including the identification of the sustainability indicators proposed by the GRI, SDG, and COBIT and the mapping of the sustainability goals adopted by the main IT companies aligned with GRI, SDG, and COBIT, 50 sustainability indicators were identified to be adopted by micro and small software companies. These indicators comprise the three dimensions: environmental, social, and economic, in addition to governance.

4.4. Relationship between the Sustainable Indicators in the Reviewed Reports and the One Proposed This Study

In order to evaluate the set of indicators proposed by this study, the indications of the GRI reporting items were verified, as well as the SDG indications that the companies linked to their sustainable goals, aiming to identify whether the proposed indicators are supported in the sustainability reports published by the analyzed companies. These indications are noted in the report and in indexes referenced in the reports, whenever the document uses the standard established by the GRI.

It is noteworthy that the analyses of the sustainability reports suggest that the essential report model has an average of 19 indicators adhering to the proposed model. The comprehensive model, on the other hand, has 41 of the 50 proposed indicators adhered to.

Among the proposed indicators and those reported in the analyzed essential sustainability reports, it was observed that the items related to governance have the lowest adherence, given that of the 19 proposed indicators, nine were not reported by the companies that use these standards, especially for the indicators that address governance actions aimed at sustainability.

As for the indicators related to the environmental, economic, and social dimensions, it was observed that of the six economic indicators proposed, on average, 3.75 are not included in the analyzed essential model reports. In the environmental dimension of the

11 proposed indicators, on average, six were not reported in the analyzed reports, and in the social dimension of the 14 proposed indicators, on average, 10 are not included in the analyzed reports.

At the same time, the reports that use the comprehensive model showed greater adherence to the proposed indicators, highlighting the governance indicators with 84.21% and environmental indicators with 83.64% of adherence. The social and economic indicators showed 77.14% and 80% adherence, respectively, to the set of indicators proposed by this study.

When considering the three dimensions of sustainability—environmental, economic, and social, the analyzed reports suggest that companies focus their efforts on environmental and social indicators, confirming the findings of this research that found a greater relationship between these indicators and the requirements of the COBIT maturity model. These findings are also supported by the SDG's prioritization related to social and environmental issues reported in the verified reports.

On the other hand, considering that the set of 50 indicators proposed aims to place micro and small companies in the context of sustainability, some indicators prioritized by large companies, if adopted by micro and small companies, can lead them along the paths of sustainability. Among the governance indicators, we highlight risk management and stakeholder engagement. As for the economic aspect, the indicators are of investments in infrastructure and economic impacts and value creation. With regard to the environmental dimension, indicators of efficient use of energy, rational use of water, packaging recycling, and waste disposal lead companies towards sustainability. In the same way, social indicators related to labor relations, engagement with the community, and adoption of inclusion and diversity policies will allow these companies to align themselves with the social and environmental demands required in the global corporate scenario.

5. Discussion

The use of indicators to manage the sustainability goals established by companies and to establish sustainable standards of device production in the development of applications/software, suggested by Sage (1997) and Debreceny and Gray (2013), were identified in the analyzed reports.

Considering the SDGs and GRI reporting items, an analysis was carried out to identify their relationship with the requirements of the COBIT model, with the aim of generating a set of indicators that aggregate the three lines of corporate sustainability: environmental, economic, and social.

The result of these analyses is that the environmental and social indicators (GRI and ODS) are more adherent to the COBIT model, reinforcing the current trend of social and environmental indicators [27,28]. It was also observed that the economic indicators were less mentioned in the sustainability reports prepared and made available by the companies.

On the other hand, IT corporate governance, which permeates the sustainability aspects considered in this study, presented 19 converging items, reinforcing compliance with international rules linked to Sarbanes–Oxley's transparency and compliance practices, as well as the definitions of the management and strategic alignment established by the GTI and adoption of the COBIT model itself, which is an efficient tool for managing activities carried out in software and information and communication technology companies.

Regarding the set of 50 proposed indicators, it was observed that they are unevenly distributed between environmental, economic, and social aspects, as described below.

- Environmental aspect → this dimension linked to the GRI items related to energy presented four items for energy, one item for manager environmental, and three items for products and services, adding up to eight COBIT requirements.
- Economic aspect → this dimension has seven items related to the economic and product aspects. One item of policies, two items of corporate environment management, one item of financial management, two items of contract management, and one of data management were verified, totaling seven COBIT requirements.

- Social aspect → Five items of the GRI social—labor relations and one item of social—society are strongly similar to eight requirements of COBIT, as shown in Table 1 of this study.

It was also observed that 29 items of governance, strategy, and engagement of stakeholders established in the GRI are following 16 requirements of the EDM dimension of COBIT, and that these comprise the analysis of the ESG indicators of the rating companies. In view of the results, it was confirmed that the proposed indicators include the three aspects of sustainability—environmental, economic, and social.

Regarding the feasibility of using the proposed set of indicators, although limited, given the number of sustainability reports analyzed, these were adequate to the current concerns of technology companies with the use of renewable energy, and sustainable productive means, considering the entire product and/or service life cycle and greenhouse gas emissions from its operations and suppliers.

At the same time, it is observed that investors have been looking for companies that have their strategy focused on the sustainability of their operations, especially those that aim to preserve and optimize the use of natural resources, control greenhouse gas emissions, and manage waste generated, as well as adopting inclusive policies in the hiring of its employees, engaging partners, suppliers, and local communities in business, and within its area of operation, generating value for society.

In this new scenario of opportunities, micro and small companies can and should take ownership of sustainable practices aiming to improve their operational performance, due to the satisfaction and engagement of their employees and partners, at the same time obtaining investments to expand their business and expand the portfolio of customers, generating value for partners, employees, and the parties involved.

6. Conclusions

This study showed the relationship between the GRI report items and the SDG sustainability indicators and requirements of the COBIT maturity model and presented, as a result of these relationships, a set of 50 indicators of similar content. The result of this comparative analysis was the identification of 26 items from COBIT, 21 items from GRI reports, 16 objectives, and 48 goals from the SDG that make up the standard essential model. In the case of the comprehensive model reports analyzed, 55 COBIT items, 41 GRI indicators, 16 objectives, and 48 SDG targets were observed when compared with the proposed set of 50 indicators.

This set was put to the test when compared to sustainability reports published by nine multinational technology companies, in which it was identified that these companies focus their efforts on indicators related to governance practices, stakeholder engagement, risk analysis and financial opportunities, investments in infrastructure, targeting for value generation, efficient use of resources such as water and energy, reduction of greenhouse gas emissions, creation of a safe, collaborative, and inclusive work environment, training of workers, management of suppliers with regard to labor relations, and sustainability. It was also identified that these companies established in their corporate goals to meet some ODS, among which stand out the ODS8 (decent work and economic growth) indicated by all companies, the ODS13 (climate action) which is the focus of eight out of nine, and ODS3 (good health and well-being) and ODS9 (industries, innovation, and infrastructure) prioritized by seven of the nine companies analyzed.

Finally, due to the limitations presented in this study, we suggest an expansion of this research, covering a larger number of companies, in order to analyze the economic, social, and environmental aspects of operations in software companies. It is also suggested to conduct research, including micro and small companies, using other methods, such as the application of electronic questionnaires and/or online interviews.

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data curation, M.C.M.; writing—original draft preparation, M.C.M.; writing—review and editing, M.C.M.; visualization, M.C.M.; supervision, T.C.M.B.C.; project administration, M.C.M. All authors have read and agreed to the published version of the manuscript.

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