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The impact of technological innovation on the social and environmental dimensions of CSR: the case of Moroccan industrial companies.

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Abstract

Technological innovation and Corporate Social Responsibility (CSR) are fundamental pillars supporting strategic performance and sustainable value creation in the contemporary economic landscape. This article explores the dynamic relationship between technological innovation and CSR, specifically focusing on its environmental and social dimensions. More precisely, the study aims to evaluate the direct impact of innovation and to determine how this primary relationship is moderated by organizational and governance factors. To address this research gap, a quantitative field study was conducted using a sample of 500 Moroccan industrial firms. Data analysis was performed through the Covariance-Based Structural Equation Modeling (CB-SEM) method, yielding robust results. The empirical results confirm a direct, positive, and highly significant impact of technological innovation on the environmental and social dimensions of CSR. Furthermore, the study validates the contingency hypothesis by demonstrating a positive moderating effect of governance factors. This synergy suggests that the effectiveness of technological innovation on CSR is substantially amplified by the presence of robust organizational governance structures. These conclusions enrich the existing CSR literature within an emerging market context and provide essential managerial implications for the successful integration of technology into corporate sustainability strategy.

Keywords: Technological innovation, Corporate Social Responsibility (CSR), Environmental RSE, Social RSE, Governance factors, industrial companies.

List of Abbreviations:

- **CB-SEM**: Covariance-Based Structural Equation Modeling
- **CFI** : Comparative Fit Index
- **TLI**: Tucker-Lewis Index
- **CSR** : Corporate Social Responsibility
- **CR** : Composite Reliability
- **GRI** : Global Reporting Initiative
- **QWL**: Quality of Working Life
- **MLR** : Maximum Likelihood Robust
- **SDGs:** Sustainable Development Goals
- **RMSR**: Root Mean Square of Residuals
- **AVE** : Average Variance Extracted
- **TBL**: Triple Bottom Line
- **RBV: Resource-Based View**

Introduction

In an increasingly globalized and rapidly changing economic environment, technological innovation has become a necessary condition, not only for success but also for the long-term survival and sustainable competitiveness of organizations (Schumpeter, 1942). Parallel to this competitive pressure, Corporate Social Responsibility (CSR) has transcended its status as a mere moral obligation to establish itself as a strategic imperative (Carroll, 1991; Elkington, 1997). Today, firms are required to balance their pursuit of profitability with the mitigation of their social and environmental impacts, a crucial step in addressing global challenges such as climate change and achieving the United Nations' Sustainable Development Goals (SDGs).

The intersection of these two domains innovation and CSR has become a subject of paramount importance in contemporary literature. Technological innovation is widely recognized as a powerful engine capable of offering concrete solutions for emissions reduction, resource optimization, and the promotion of the circular economy (UNEP, 2022; Zhang et al. 2020). However, the success of this transformation is not solely dependent on the technology itself, but on the capacity of firms' internal structures and governance to effectively integrate it. Innovation that is not supported by robust organizational and ethical frameworks risks yielding only marginal impact or, worse, generating negative externalities. This observation highlights a crucial gap in the existing literature. While the direct link between technological innovation and CSR is now established, the contingent role of organizational factors that amplify or impede this relationship remains insufficiently explored, particularly within emerging economies.

The primary objective of this research is to examine the impact of technological innovation on the environmental and social dimensions of CSR within a rapidly evolving market, and to determine the extent to which this relationship is shaped by organizational and governance factors. Therefore, the central research question is posed as follows:

What is the impact of technological innovation on the environmental and social dimensions of CSR, and how is this relationship conditioned by organizational and governance factors within Moroccan industrial firms?

To address this question, we will first present a literature review, defining the core concepts of technological innovation and CSR. Subsequently, we will clarify and analyze the theoretical links between these two concepts. Finally, we will present an empirical study based on a sample of 500 industrial companies in Morocco to test the direct causal hypotheses and the moderation hypotheses.

1. Innovation: literature review

1.1. Definition of innovation

Innovation, although an ancient concept, was first formally defined by Schumpeter in 1935. He defined innovation as the successful introduction into the market of a new product, a new manufacturing process, or a new organizational form within the enterprise. Schumpeter's pioneering research subsequently opened new perspectives for the study of innovation.

The study of innovation has evolved considerably, becoming a key element of contemporary economic analysis. Modern approaches focus on the various forms and types of innovation, considering their nature and their influence on economic activity.

According to the European Commission Green Paper of 1995, innovation is defined as "the successful production, assimilation, and exploitation of novelty in the economic and social spheres."

According to the Oslo Manual (2005), innovation is "the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations." This concept can thus be applied to the technological, economic, managerial, and cultural domains, extending beyond businesses to institutions, territories, and lifestyles.

This manual specifies four forms of innovation:

- **Product (or Service) Innovation:** Concerns the core characteristics of the product or service, such as its quality, reliability, or use, with the goal of distinguishing it from competitors' offerings.
- **Process Innovation:** Consists of replacing or renewing equipment and continuously improving methods and the organization of production, which leads to cost reduction and, consequently, increased productivity.
- **Organizational Innovation:** This encompasses all changes affecting the structure and organization of work within the company, its human resources, and its ability to anticipate new techniques and market needs.
- **Marketing Innovation:** This involves all changes and improvements in product design, packaging, conditioning, promotion, and pricing to better meet customer and market demands.

From the definitions mentioned above, it is clear that innovation is a complex concept, encompassing diverse fields (Damanpour & Schneider, 2006). It includes both technological and non-technological innovations, which can be classified as product, process, organizational, and marketing innovations (Baregheh et al., 2009). The level of novelty is then evaluated based on whether the innovation is radical or incremental (Dewar & Dutton, 1986). Incremental innovations

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involve improving existing products, while radical innovations involve introducing entirely new products (Un, 2010).

In our research, we have chosen to focus primarily on technological innovation.

1.2. Definition of technological innovation

Technological innovation plays an essential role in preserving the competitiveness of firms and their long-term sustainability (Tidd & Bessant, 2018). It is part of the broader innovation framework, focusing specifically on technology and its successful integration into products, services, and processes. As knowledge, technology can be seen as a fundamental pillar of technological innovation, supporting research, design, development, production, and marketing activities (Jantsch, OECD, 1967).

According to Pavitt (2003), technological innovation is characterized by the production of new scientific and technological knowledge that transforms products, systems, processes, and services to meet user needs and market demands.

The Frascati Manual (OECD, 2002) states that technological innovations encompass products and processes that are new or significantly technologically modified, where the innovation lies in their performance characteristics, as opposed to simple improvements.

2. Corporate Social Responsibility: theoretical foundations

2.1. Definition of CSR

To address economic, social, and environmental risks, preserve the firm's reputation among all stakeholders, and meet legitimacy requirements, a new concept oriented towards sustainable development has emerged in the business world. This concept is referred to as Corporate Social Responsibility (CSR).

According to the European Commission, CSR is "a concept whereby companies integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis" (European Commission, 2001).

As for the ISO 26000 standard, it defines CSR as a lever for achieving sustainable development by adopting transparent and ethical behavior that takes into account the expectations of stakeholders, respects the law and international norms of behavior, and is fully integrated and applied throughout the organization and in its relationships (International Organization for Standardization, 2010).

2.2. Theoretical framework of CSR

Figure 1: The CSR pyramid

Source: Carroll (1991)

Carroll's model (1991) proposes four fundamental dimensions of Corporate Social Responsibility (CSR): economic, legal, ethical, and philanthropic. According to this framework, firms must first meet an economic responsibility by generating profits, then satisfy their legal obligations by complying with laws and regulations. The ethical dimension requires acting justly and fairly, while the philanthropic responsibility concerns actions aimed at improving societal well-being (Carroll, 1991).

The 1990s also saw the emergence of the "triple bottom line" (TBL) concept, popularized by John Elkington (1997) in *Cannibals with Forks: The Triple Bottom Line of 21st Century Business*.

According to this approach, a firm's performance must be evaluated across three dimensions: economic (Profit), social (People), and environmental (Planet). These three "Ps" constitute interdependent pillars of sustainability.

While these models offer a comprehensive framework, the present research focuses specifically on the environmental and social dimensions for reasons of relevance and measurability. These two dimensions form the core of global sustainable development concerns, being directly linked to the United Nations' Sustainable Development Goals (SDGs). Furthermore, they represent the most critical and directly measurable pillars according to international reference standards for reporting and auditing, such as ISO 26000 and the Global Reporting Initiative (GRI).

3. Link between technological innovation and CSR

3.1. Literature review on the relationship between technological innovation and Corporate Social Responsibility (CSR)

The link between technological innovation and Corporate Social Responsibility (CSR) remains underexplored in the economics and management sciences literature. One possible explanation lies in the fact that these two concepts are traditionally analyzed through different, disjointed approaches to the theory of the firm.

On one hand, technological innovation is typically studied through the lens of the Resource-Based View (RBV) (Wernerfelt, 1984; Barney, 1991, 2001) and Dynamic Capabilities (Teece and Pisano, 1994). These frameworks analyze innovation as an internal process of creating and integrating new knowledge, primarily aimed at achieving competitive advantage, but they generally neglect relations with external stakeholders.

On the other hand, CSR is firmly rooted in the Stakeholder Theory, formalized by Freeman (1984), which seeks to understand the firm's environment and structure high-performing organizations that contribute to value creation (Gond et Mercier, 2004).

Despite these separated approaches, a critical point of convergence lies in the role of resources. Hart (1995) developed the Natural-Resource-Based View of the firm, arguing that resources enabling firms to address environmental issues constitute a key competence for sustainable competitive advantage. This perspective integrates optimal life cycle management and stakeholder expectations, establishing a first bridge between sustainability concerns and the foundations of the RBV. Furthermore, recent developments in Open Innovation (Chesborough, 2003) directly include stakeholders in the innovation process, offering another area of convergence (MacGregor and Fontrodona, 2008).

Research on the relationship between technological innovation and sustainable development has undergone a significant evolution (Mathieu, 2010). It was initially viewed negatively, then shifted to a more positive perspective. Previously, technological innovation was often perceived as a major cause of economic unsustainability, particularly on the environmental front, generating negative externalities such as pollution or undesirable social impacts like job displacement due to increased productivity. However, today, technological innovation is increasingly recognized as an opportunity for firms to contribute to sustainable development, i.e., to CSR (European Communities Commission, 2002), while simultaneously enhancing their competitiveness.

3.2. Impact of technological innovations on social and environmental dimensions of CSR

• Social dimensions

Within the framework of CSR, technological innovation can become a powerful vector for social transformation, provided it is deployed with an inclusive, ethical, and human-centered logic (Stilgoe, Owen, & Macnaghten, 2013). Digital technologies facilitate the improvement of working conditions, allowing for the reduction of repetitive, arduous, or dangerous tasks, and increasing employee autonomy and flexibility, notably through remote work (Klein et al., 2012).

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Cascio and Montealegre (2016) demonstrated how digital technologies can enhance work flexibility, allowing employees to better manage their work-life balance. Similarly, facilitated access to online training resources can contribute to professional development and job satisfaction (Noe et al., 2014).

However, other studies have highlighted the potential challenges of technological innovations for Quality of Working Life (QWL). Barley et al. (2011) emphasized how the intensive use of communication technologies can lead to work overload and a blurring of professional and personal life boundaries, negatively affecting employee well-being. Furthermore, the increased digital surveillance made possible by these technologies raises crucial questions about autonomy and trust at work (Jeske & Santuzzi, 2015).

• Environmental dimensions

On the environmental front, innovation is one of the major levers for the ecological transition. Intelligent energy management technologies, emissions monitoring systems, or climate impact modeling contribute to an effective reduction of organizations' ecological footprint (UNEP, 2022). The emergence of digital tools also promotes the circular economy by supporting recycling, waste recovery, and the optimization of raw material usage (UNEP, 2022).

These levers are amplified by recent advancements in fields such as Artificial Intelligence applied to energy optimization, low-impact additive manufacturing, and smart grid systems for water and electricity networks, which offer new perspectives for reducing the ecological footprint of human activities (Zhang et al. 2020).

In the industrial sector, the rise of "Industry 4.0" has favored the introduction of connected sensors and real-time monitoring systems. These devices facilitate more rational resource management by quickly detecting anomalies, anticipating maintenance needs, and reducing raw material waste (Shrouf et al. 2014).

4. Empirical analysis

4.1. Hypothesis formulation

The conceptual model developed to address the research problem translates into a structured set of theoretical relationships to be empirically tested. It is based on the articulation between technological innovation, Corporate Social Responsibility (CSR), particularly its social and environmental dimensions, and various organizational factors likely to influence this relationship. This structure involves latent constructs, causal relationships, and a set of hypotheses requiring rigorous statistical evaluation.

To this end, we have chosen to test four key hypotheses related to our research question:

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• Direct relationships: technological innovation and CSR

The first hypotheses examine the direct relationship between technological innovation and the two CSR dimensions, mainly grounded in Sustainable Innovation Theory and the Resource-Based View (RBV).

Hypothesis 1 (H1): Technological innovation positively and significantly influences the environmental dimensions of CSR (emissions reduction, energy efficiency, and waste management) within Moroccan industrial firms.

Hypothesis 2 (H2): Technological innovation positively and significantly influences the social dimensions of CSR (working conditions, inclusion, and skills development) within Moroccan industrial firms.

• Moderation relationship: organizational governance

The impact of technologies on CSR is conditioned by the firm's internal capacity to implement innovation and by the external pressures that structure its strategic choices, as justified by the Institutional Theory.

Hypothesis 3 (H3): Organizational governance (culture, strategy, R&D, regulation, and stakeholder pressure) positively moderates the impact of technological innovation on the environmental dimensions of CSR.

Hypothesis 4 (H4): Organizational governance (culture, strategy, R&D, regulation, and stakeholder pressure) positively moderates the impact of technological innovation on the social dimensions of CSR.

4.2. Research methodology and sample

This research follows a hypothetico-deductive approach, characteristic of the Post-Positivist paradigm. This process is based on a quantitative methodology, utilizing a questionnaire administered to a sample of 500 Moroccan industrial firms. The analysis relies on the Covariance-Based Structural Equation Modeling **(**CB-SEM**)** approach, considered the most appropriate method for simultaneously testing our hypotheses and analyzing direct causal relationships and moderation effects between the latent variables of our model. The estimation of the CB-SEM model was performed using the statistical software R.

4.2.1. Descriptive analysis of the sample

Descriptive analysis constitutes a fundamental methodological prerequisite for any multivariate investigation, allowing for the characterization of the structural composition of the sample and the evaluation of its representativeness relative to the Moroccan industrial fabric.

The characteristics of the sample retained for our study are presented as follows:

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Table 1: Distribution of firms by workforce size

Size Category	**Headcount (N)**	**Proportion (%)**	**Cumulative Proportion (%)**
More than 250 employees	160	32,0	32,0
51 to 250 employees	156	31,2	63,2
10 to 50 employees	139	27,8	91,0
Less than 10 employees	45	9,0	100,0
Total	**500**	**100,0**	-

Source : Élaboration personnelle à partir des résultats SEM (logiciel R).

The analysis of the distribution of firms by workforce size reveals an **inverted growing distribution,** characterized by a marked predominance of medium and large enterprises. Large enterprises (more than 250 employees) constitute the modal category with 160 units (32.0% of the sample), followed by medium-sized enterprises (51 to 250 employees) totaling 156 units (31.2%). Small enterprises (10 to 50 employees) represent 139 units (27.8%), while very small enterprises (less than 10 employees) account for only 45 units (9.0%).

Table 2: Sectoral distribution of Moroccan firms

Activity Sector	**N**	**%**	**% Cum**
Agri-food Industry	110	22,0	22,0
Automotive / Aeronautics Industry	100	20,0	42,0
Chemical and Parachemical Industry	92	18,4	60,4
Electronic and Technological Industry	73	14,6	75,0
Textile and Clothing Industry	70	14,0	89,0
Energy Industry (Renewables)	30	6,0	95,0
Construction and Materials Industry	25	5,0	100,0
Total	**500**	**100,0**	-

Source : Élaboration personnelle à partir des résultats SEM (logiciel R).

The sectoral analysis reveals a moderate concentration across three major industries, totaling 60.4% of the sample, which reflects the industrial priorities of the Moroccan economy. The agri-

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food industry dominates with 110 firms (22.0%), the automotive industry accounts for 100 firms (20.0%), and the chemical and parachemical industry totals 92 firms (18.4%). Complementary sectors show a decreasing representation: the electronic and technological industry comprises 73 firms (14.6%), the textile and clothing industry 70 firms (14.0%), the energy industry (renewables) 30 firms (6.0%), and the construction and materials industry 25 firms (5.0%).

4.3. Analysis of empirical results

Structural Equation Modeling (SEM) constitutes the analytical apex of this research, allowing for the simultaneous testing of the measurement model (relationships between latent variables and observed indicators) and the structural model (causal relationships between constructs). The approach adopted integrates a moderation effect of organizational governance on the relationship between technological innovation and CSR performance, in accordance with the theoretical hypotheses developed.

The estimation method employed is Maximum Likelihood Robust **(**MLR**)** with Yuan-Bentler correction, which is appropriate for managing potential deviations from multivariate normality and heteroscedasticity.

4.3.1. Validation of the measurement model

The psychometric validation of the measurement instruments constitutes a fundamental methodological prerequisite before interpreting the structural relationships. This rigorous evaluation focuses on two main dimensions: internal reliability (coherence of items within each construct) and convergent validity (relevance of the indicators for the theoretical concept). The assessment of these properties relies on a set of complementary indices: Cronbach's Alpha, Composite Reliability (CR), and Average Variance Extracted (AVE). The satisfaction of the acceptance thresholds for these indices guarantees the quality and robustness of the latent constructs used in Structural Equation Modeling (SEM).

The results of the psychometric validation allow for several meaningful methodological conclusions. First, all constructs satisfy the minimum criteria for Composite Reliability (CR) and Convergent Validity (AVE), authorizing their use in the structural modeling phase. Second, the exceptional performance of the CSR constructs (Environmental: α = 0.90, AVE = 0.651; Social: α = 0.87, AVE = 0.576) validates the quality of the scales developed and confirms the relevance of their conceptual distinction. Third, the organizational constructs (Innovation: α = 0.83; Governance: α = 0.81), although slightly lower, exhibit satisfactory psychometric properties after purification, validating earlier methodological decisions to suppress problematic items.

By satisfying the most stringent methodological standards of SEM, the demonstrated reliability and convergent validity ensure that the causal relationships identified between technological

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innovation, organizational governance, and CSR performance reflect genuine associations between the latent constructs, thereby mitigating the risk of measurement artifacts.

4.3.2. Global assessment of the structural model fit

The evaluation of the structural model's adequacy to the empirical data is a fundamental prerequisite before any interpretation of the structural coefficients. This assessment relies on a battery of complementary indices, each providing a specific perspective on the quality of fit.

Table 3: Fit indices of the structural model with moderation

Fit Index	**Model Result**	**Acceptance Threshold**	**Evaluation**
Absolute Indices			
χ^2 (Chi-square)	416,149	-	-
df	265	-	-
p- value	< 0,001	> 0,05	Rejected
χ^2/df	1,570	< 3,0	**Excellent**
RMSEA	0,034	≤ 0,06	**Excellent**
RMSEA 90% CI	[0,027 ; 0,040]	Upper bound < 0,08	**Excellent**
Incremental Indices			
CFI	0,974	≥ 0,95	**Excellent**
TLI	0,970	≥ 0,95	**Excellent**

Source : Élaboration personnelle à partir des résultats SEM (logiciel R).

The table shows that the structural model exhibits an exemplary fit to the empirical data. The Chi-square test (χ^2 = 416.149; df= 265; p < 0.001) formally rejects the null hypothesis of perfect model fit, an expected result given this statistic's sensitivity to sample size and minor specification deviations. However, the χ^2/df ratio of 1.570 remains significantly below the threshold of 3.0 established by Carmines and McIver (1981). The convergence of absolute error indices (RMSEA = 0.034, with a very narrow 90% CI of [0.027; 0.040]) is an excellent value according to Browne and Cudeck's (1993) criteria and well below the 0.06 threshold advocated by Hu and Bentler (1999). Incremental indices (CFI = 0.974 and TLI = 0.970) further confirm the quality of the fit.

4.3.3. Testing and validation of causal and moderation hypotheses

The analytical core of the SEM involves the estimation and interpretation of the structural coefficients linking the latent variables. The specified model simultaneously tests the direct effects of technological innovation and organizational governance on the two CSR dimensions, as well as the interaction effects (moderation) between innovation and governance.

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Table 4 : Structural coefficients : Direct and moderation effects

Variable	Predictor	β non-std.	S.E.	z	β std.	Interpretation
Environmental Responsibility (R^2 = 0,439)						
ENV	TECH	0,489***	0,045	10,856	0,502	Strong Effect
	TECH×ORG	0,138**	0,050	2,734	0,109	Sig. Moderation
Social Responsibility ***(R^2 = 0,430)***						
SOC	TECH	0,463***	0,042	10,907	0,515	Strong Effect
	TECH×ORG	0,181***	0,049	3,665	0,154	Sig. Moderation

Note: *** p < 0,001, ** p < 0,01; β std. = Standardized coefficient; S.E. = Standard Error

Source : Élaboration personnelle à partir des résultats SEM (logiciel R).

- ENV = Environmental Responsibility (Endogenous Latent Variable)
- SOC = Social Responsibility (Endogenous Latent Variable)
- TECH = Technological Innovation (Exogenous Latent Variable)
- TECH×ORG = Technological Innovation×Organizational governance: Interaction Term (Moderation)

Direct effects of technological innovation Technological innovation exerts a **substantial and highly significant direct effect** on both dimensions of CSR. For Environmental Responsibility (ENV), the standardized coefficient reaches 0.502 ($z = 10.856$; $p < 0.001$). For Social Responsibility (SOC), the effect is established at 0.515 ($z = 10.907$; $p < 0.001$), a slightly higher magnitude suggesting a particular sensitivity of the social dimension to technological innovations. These results empirically validate Hypotheses H1 and H2, which state that technological innovation positively and substantially influences CSR across both its dimensions.

Moderation effects: testing the contingency hypothesis The interaction effects between technological innovation and organizational governance constitute the empirical test of the organizational contingency hypothesis. The results reveal **statistically significant moderation effects** for both CSR dimensions, albeit of modest magnitude. For Environmental Responsibility, the interaction coefficient reaches 0.109 ($z = 2.734$; $p = 0.006$), while for Social Responsibility, it is 0.154 ($z = 3.665$; $p < 0.001$). These positive coefficients indicate that the effect of technological innovation on CSR is **amplified** in contexts characterized by strong organizational governance, thereby confirming Hypothesis H3 et H4. Mathematically, this means the slope of the Innovation-CSR relationship increases with the level of organizational governance, consistent with a synergistic organizational model.

4.3.4. Synthesis of results

The model test using Structural Equation Modeling (SEM) confirms the robustness of the theoretical structure, with a substantial explained variance (R^2) of 43.9% for Environmental CSR and 43.0% for Social CSR.

1. **Validation of direct effects (H1 and H2)**

The results confirm a positive and highly significant influence of technological innovation on Corporate Social Responsibility (CSR) in both dimensions:

- **H1 Confirmed**: Technological innovation positively influences Environmental CSR ($\beta = 0.502$; $p < 0.001$).
- **H2 Confirmed**: Technological Innovation positively influences Social CSR ($\beta = 0.515$; $p < 0.001$).

The quasi-identical magnitude of these effects (0.502 vs 0.515) suggests a balanced impact of innovation on both environmental and social issues, contradicting the assumption of environmental predominance.

2. **Validation of the moderation effect (H3 and H4)**

The analysis of organizational governance as a moderating variable reveals the major theoretical contribution of this study:

- **H3 Confirmed**: Organizational governance positively moderates the impact of technological innovation on the environmental dimensions of CSR ($\beta = 0.109$; $p < 0.05$).
- **H4 Confirmed**: Organizational governance positively moderates the impact of technological innovation on the social dimensions of CSR ($\beta = 0.154$; $p < 0.001$).

These results indicate that the effect of technological innovation on CSR is amplified by strong organizational governance. The more pronounced moderation effect on the social dimension (0.154 vs 0.109) suggests that governance practices play a particularly crucial role in translating technological innovations into social benefits.

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Conclusion

This research aimed to explore the complex relationship between technological innovation and Corporate Social Responsibility (CSR), specifically concerning its social and environmental dimensions, by examining the role of organizational governance as a contingency factor within the Moroccan industrial context.

The results, obtained through Covariance-Based Structural Equation Modeling (CB-SEM) on a sample of 500 firms, confirmed all formulated hypotheses.

Firstly, the study validates a direct, positive, and highly significant impact of technological innovation on both environmental and social responsibility. This validation suggests that technologically innovative firms are more inclined to adopt responsible practices.

Secondly, the research confirms the contingency hypothesis: organizational governance exerts a positive moderating effect on this relationship. The strength of the link between innovation and CSR is amplified in firms possessing robust governance mechanisms.

Theoretically, this study enriches the literature within an emerging context by providing empirical validation of the synergy between technological and organizational factors. It underscores that CSR should be conceptualized not merely as the outcome of technical innovation, but as an integrated management system.

However, the scope of our conclusions is limited to the environmental and social dimensions of CSR. An essential avenue for future research would be to further elucidate this relationship by integrating and modeling the economic and ethical dimensions of CSR to offer a more exhaustive understanding of firms' societal performance.

Managerially, these conclusions provide crucial strategic guidelines. Business leaders should view technological innovation not as a simple cost, but as a strategic lever for CSR. More importantly, firms seeking to maximize the CSR return on their technological investments must prioritize the reinforcement of their governance. This strategic alignment enables the transformation of technological potential into effective societal impact.

While the research yields robust results, it presents certain inherent methodological limitations. The cross-sectional nature of data collection limits the ability to establish strict causality and to observe the evolution of CSR practices over the long term. Furthermore, the exclusive focus on the Moroccan industrial sector requires caution regarding the generalization of results to other sectors, such as services, or to other geographical areas.

These limitations open several perspectives for future research:

1. Longitudinal studies: It would be pertinent to conduct longitudinal studies to observe the temporal dynamics of this relationship.
2. **Thematic focus:** Future research could focus on studying the **obstacles and barriers** encountered by firms when integrating technology and CSR, particularly constraints related to investment costs, resistance to change, or specific regulatory limitations.
3. **Qualitative approach:** Finally, adopting a **qualitative approach** is necessary to better understand the internal dynamics and processes that allow innovative firms to transcend challenges of uncertainty and embed CSR within their business model.

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