Global Business and Management Research: An International Journal
Vol. 16, No. 4s (2024)

Exploring the impact of green human resource management on technological innovation and corporate performance in China's photovoltaic industry

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Abstract
Purpose: Innovation and performance impacts of firms on the photovoltaic industry through green motivation and green incentives.
Design/methodology/approach: A spectrum of PV firms with qualitative semi-structured interviews among key industry personnel. This approach furnishes a nuanced understanding of how GHRM practices modulate the interplay between Technological Innovation and Corporate Performance.
Findings: The findings reveal that Green Motivation and Green Incentives, as integral components of GHRM, play a significant role in steering the course from Technological Innovation to enhanced Corporate Performance. These elements of GHRM are identified as critical drivers that leverage technological advancements to bolster corporate success in the PV industry.
Research limitations/implications: The focus on China's PV industry potentially narrows the generalizability of the findings. Future research could broaden the scope to other industrial or geographical settings to elucidate the universal applicability of the observed relationships.
Practical implications: The study underscores the pivotal role of Green Human Resource Management (GHRM) in fostering technological innovation, offering strategic insights for enhancing corporate performance in the photovoltaic (PV) sector.
Originality/value: This research enriches existing literature by examining GHRM's regulatory function in the interaction between technological innovation and corporate performance in China's PV industry for sustainable growth and innovation in renewable energy.

Keywords: Green Human Resource Management (GHRM), Technological Innovation, Corporate Performance

Introduction

The prominence of China's Photovoltaic (PV) sector within the global arena of renewable energy is undeniably substantial, marked by significant capital infusion and a notale transference of solar PV manufacturing prowess from regions like Europe, Japan, and the United States to China over the preceding decade (Shubbak, 2019; Li et al., 2021). With an investment exceeding USD 50 billion in fresh PV supply capacity, a figure that overshadows

Europe's investment tenfold, China has also fostered the creation of over 300,000 manufacturing employment opportunities within the solar PV value spectrum since 2011 (Liu et al., 2020; Wang et al., 2020). The ascent trajectory of China's PV domain is remarkable, with anticipations of a continual expansion in solar capacity, projected to span between 413 to 569 gigawatts from 2022 through to 2026. Notably, the year 2023 alone is poised to witness the addition of solar power capacity ranging between 95 to 120 gigawatts (Chowdhury et al., 2020; Zhang et al., 2020).

Amidst this rapid expansion, the crucial connection between technological innovation and corporate performance comes to the forefront (Awosusi et al., 2022). The evolution and competitive standing of the sector largely contingent on ongoing technological advancements and the adeptness in navigating a multifaceted regulatory framework (Irfan et al., 2021). Concurrently, the human resource facet, particularly Green Human Resource Management (GHRM) underscored by green ability and green motivation, emerges as a cardinal element in aligning the workforce with the overarching objectives of technological innovation and environmental sustainability, thereby potentially amplifying corporate performance (Singh et al., 2020; He and Wang, 2023).China's Photovoltaic (PV) industry stands as a significant pillar in the global transition towards renewable energy, embodying a blend of technological prowess and environmental stewardship (Ba and Cao, 2023). Amidst the rapid global shift towards clean energy, the PV sector in China has burgeoned, marking an imperative stride towards the country's ambitious carbon neutrality goals. However, the journey towards these ambitious goals brings to the fore the critical nexus between technological innovation and corporate performance (Schoyen et al., 2023). It's within this juncture that Human Resource Management plays a quintessential role, potentially acting as a linchpin in fostering innovation and steering corporate performance on an upward trajectory. Photovoltaic technology, which converts sunlight directly into electricity using solar cells, is a cornerstone of renewable energy production (Hassan et al., 2024). The PV industry, encompassing the manufacturing, installation, and maintenance of solar panels, is pivotal in the global transition towards sustainable energy(Usman et al., 2024). GHRM is highly relevant in this context because it integrates environmental sustainability into HR practices, promoting innovation and enhancing competitiveness(Ali, 2023). The same time GHRM ingrains sustainability into the organizational culture, leading to more sustainable operations and long-term viability(Aleksandra et al., 2024). By adopting GHRM, PV companies can align their human resource strategies with sustainability goals, driving technological advancements and improving corporate performance.

In the contemporary discourse, the concept of Green Human Resource Management has gained a foothold, underlined by two core tenets: green ability and green motivation. Green ability encapsulates the gamut of skills, knowledge, and competencies that empowers the workforce to engage in environmentally sustainable practices (Behuria, 2020). On the other hand, green motivation entails the array of incentives, values, and attitudes that galvanize individuals to partake in green behaviors and align their actions with the organization's sustainability agenda (Arefin et al., 2021).

The interplay between GHRM and technological innovation in the PV sector potentially harbors a profound impact on corporate performance (Wahab, 2022). However, the extant literature offers a scant elucidation of how In the specific context of China's photovoltaic industry, how do the green motivation and green incentive of Green Human Resource Management impact the relationship technological innovation and corporate performance? This lacuna underscores the exigency for an in-depth exploration to unravel the dynamics encompassing GHRM, technological innovation, and corporate performance (Adeyefa et al., 2023; Hanus et al., 2019; Mia and Winata, 2014).

This narrative lays a solid foundation for delving into the intricacies of how Green Human Resource Management(GHRM), encapsulated by green ability and green motivation, acts as a conduit between technological innovation and corporate performance in China's burgeoning Photovoltaic (PV) sector (Munawar et al., 2022). The emphasis on the unique Chinese context accentuates the significance of tailoring HRM strategies to resonate with the local industrial landscape and sustainability ethos.

Literature Review

The interrelationship between technological innovation, corporate performance, and Green Human Resource Management (GHRM) is of paramount importance in understanding the dynamics that drive the Photovoltaic (PV) industry, particularly within the Chinese context. This section endeavors to delineate the existing body of literature that expounds on these dimensions, focusing particularly on the core tenets of GHRM: Green ability and green motivation, and their application within the PV sector (Corwin and Johnson, 2019; Ba and Cao, 2023; Lu et al., 2023).

Technological Innovation in the PV Sector

Technological innovation is recognized as a fundamental driver of competitive advantage and sustainability in the PV industry (Haley and Schuler, 2011; Xin and Zhen, 2019). The relentless quest for enhanced efficiency, cost reduction, and adaptation to regulatory mandates underscores the significance of technological innovation. Numerous studies have affirmed the positive correlation between technological innovation and corporate performance, elucidating how innovation in PV technology, manufacturing processes, and business models catalyzes a firm's ability to thrive amidst a competitive and evolving market landscape (Wu and Mathews, 2012). Corwin and Johnson (2019) discusses technological innovation as the adoption of new solutions that address new requirements.Renwick (2023) argued that a workforce with green skills can significantly bolster a firm's sustainability endeavors.Technological innovation acts as a pivot between organizational practices and employee outcomes(Xie, & Zhu, 2020). It represents the transformation of internal organizational characteristics into tangible systems, tools, and procedures. Damanpour (2021) identified technological innovation as an essential precursor to improved organizational outcomes, suggesting that innovation can lead to increased productivity and employee satisfaction.

Corporate Performance

Corporate performance in the PV sector is often gauged by a multitude of metrics including financial performance, market share, operational efficiency, and sustainability indices (Napathorn, 2022). The literature elucidates that firms with a strong inclination towards technological innovation tend to exhibit superior performance (Muafi and Roostika, 2022). Moreover, the synergistic interaction between technological innovation and adept human resource management practices is seen as a conduit for enhanced corporate performance, resonating with the broader sustainability ethos that the PV industry embodies (Teng et al., 2021).

Furthermore, the literature delineates the significant impact of GHRM practices on cultivating innovation, thereby propelling corporate performance to a higher echelon(Aldhaheri & Ahmad, 2024). The infusion of green motivation and green incentives, as pivotal components of GHRM, not only galvanizes technological innovation but also engenders a positive ripple effect on various facets of corporate performance (Shanthi et al., 2023). This narrative is particularly salient in the context of China's PV sector, where the imperatives of sustainability

and technological innovation are intertwined with the national agenda of transitioning towards a green economy (Allam & Cheshmehzangi, 2024).
GHRM practices, epitomized by green abilities, and motivations, contribute to enrich the bond between technological innovation and corporate performance (Ogbeibu et al., 2020). Technological innovations, when underpinned by sustainability-focused HRM practices, are more likely to appeal to an environmentally-conscious consumer base, amplifying sales and cementing market position (Masud et al., 2023). Furthermore, these innovations, resonating with global sustainability impulses, promise enduring relevance and applicability (Ari et al., 2020). The increasing focus from stakeholders on corporate sustainability mandates means that businesses championing green innovations are better positioned to secure investments, foster partnerships, and initiate collaborations, enhancing corporate performance metrics (Ye et al., 2023).

Green Human Resource Management (GHRM)

GHRM, especially its core components of green ability and green motivation, emerges as a significant paradigm in aligning the workforce with the environmental sustainability and technological innovation objectives of PV firms (Ba and Cao, 2023).
Green Human Resource Management (GHRM) has evolved as an imperative framework, supporting the alignment of human capital with the environmental sustainability and technological innovation, particularly within the photovoltaic (PV) sector (Ye et al., 2023; Teng et al., 2021). The core tenets of GHRM, namely green ability and green motivation, are quintessential in orchestrating a workforce that is adept and motivated to contribute towards environmental sustainability and technological advancements (Xie and Buavaraporn, 2019).Green Human Resource Management fosters innovation in the PV industry by integrating sustainable practices into HR strategies, thereby enhancing competitiveness and performance(Swidi et al., 2024).For example, Hanergy Thin Film Power Group provides extensive training in green technologies, equipping employees with the skills to innovate and improve efficiency. China Sunergy offers incentives for employees who develop new energy-saving products or processes, encouraging continuous innovation (Wang et al., 2021). Jinko Solar promotes a culture of sustainability through regular workshops and seminars, motivating employees to adopt green practices (Luo et al., 2021;Zhang et al., 2024). Additionally, Yingli Solar encourages cross-department collaboration to support and implement innovative ideas (Liu, 2024).These practices show how GHRM creates an environment conducive to innovation, boosting the competitiveness and performance of Chinese PV companies (Wang, 2024).

Green Ability

Green ability encapsulates the essential skills, knowledge, and competencies that empower employees to engage in environmentally sustainable practices (Abdulrahman, 2022). It is posited that a workforce endowed with green ability is better positioned to contribute to technological innovation, thereby augmenting corporate performance (Ali et al., 2023). The literature also explores various HRM practices that foster green ability, including training and development, knowledge sharing, and performance appraisal systems (Kloutsiniotis et al., 2023).
Moreover, the literature accentuates the profound impact of green ability on the nexus between technological innovation and corporate performance (Chu et al., 2022). For instance, studies have expounded on the pivotal role of green ability in facilitating green innovation, which in turn significantly augments environmental performance (He and Wang, 2023). The essence of green innovation as a conduit for enhancing environmental performance underscores the

criticality of fostering green ability among the workforce (Zhang et al., 2023; Nureen et al., 2023).

Green ability, defined as the essential skills, knowledge, and competencies for engaging in environmentally sustainable practices, is crucial for promoting technological innovation and enhancing corporate performance in the photovoltaic (PV) sector (Hassan et al., 2023; Grubb et al., 2021). A workforce with a strong green ability is well-suited to contribute to technological advancements, thereby fostering better corporate performance. Literature suggests various HRM practices to nurture green ability, such as training and development, knowledge sharing, and performance appraisal systems (Mishra et al., 2022). These practices are fundamental in equipping employees with the necessary green skills and competencies, thus enhancing the firm's innovative capacity (Ogbeibu et al., 2021). Furthermore, green ability has a profound impact on the relationship between technological innovation and corporate performance, as it facilitates green innovation, which significantly augments environmental performance (Amendolagine et al., 2023). Hence, integrating green ability within the broader framework of Green Human Resource Management (GHRM) is paramount for PV firms aiming to bolster their technological innovation and enhance corporate performance in alignment with environmental sustainability objectives (Kanan et al., 2023). GHRM enhances green ability, making PV companies more agile and adaptive in complex environments. By offering specialized training in sustainable technologies and environmental management, firms like Jinko Solar equip employees with the skills needed to innovate and improve efficiency (Hayashi, 2022). GHRM also promotes cross-functional collaboration, encouraging departments to work together on sustainability projects (Azeem et al., 2021). This not only broadens employees' expertise but also fosters a culture of continuous improvement (Yu et al 2020). Investing in green abilities helps PV companies quickly adapt to changing regulations and market demands, maintaining their competitive edge and resilience (Venzin & Konert, 2020).

In a nutshell, fostering green ability through adept HRM practices is a strategic imperative for PV firms aiming to bolster their technological innovation and enhance corporate performance (Chen and Tang, 2023; Hassan et al., 2023). Which is quintessential for navigating the intricacies of sustainable practices in the evolving landscape of China's PV sector (Amankwah, 2024).

Green Motivation

Green motivation encompasses the incentives, values, and attitudes that propel individuals towards environmentally responsible behaviors. It's the motivational impetus that galvanizes employees to align their efforts with the firm's sustainability goals (Nureen et al., 2023). The literature delineates how fostering green motivation through incentives, recognition, and a conducive organizational culture can significantly impact technological innovation and, in turn, corporate performance (Purwandani and Michaud, 2021; Mukhtar et al., 2023).

On the other hand, green motivation is delineated as a confluence of incentives, values, and attitudes that propel individuals towards environmentally responsible behaviors. It's the motivational underpinning that galvanizes employees to align their efforts with the firm's sustainability and technological innovation objectives (Ahmed, et al., 2021; Elochukwu, 2023). The literature extensively discusses how fostering green motivation through a blend of intrinsic and extrinsic incentives, recognition programs, and a conducive organizational culture engenders a positive impact on technological innovation and, in turn, corporate performance (Carrete and Arroyo, 2023). Moreover conducive organizational culture that espouses environmental sustainability as a core value significantly amplifies green motivation, creating a ripple effect that enhances technological innovation and propels corporate performance to a

higher echelon (Bag et al., 2022; Hou et al., 2023). In essence, the discourse on GHRM, underpinned by green ability and green motivation, provides a robust framework for understanding how aligning the workforce with environmental sustainability and technological innovation imperatives can significantly augment corporate performance, especially in the dynamic landscape of the PV sector (Chiarelli, 2021; Teng et al., 2021).GHRM boosts green motivation, making PV companies more agile in complex environments(Shahriari et al., 2020). Hanergy Thin Film Power Group, for example, uses incentive programs to reward employees for meeting sustainability goals like reducing emissions or developing eco-friendly products (Ribeiro et al., 2022). Regular workshops and seminars reinforce the importance of green practices, aligning employee motivations with company objectives (Adriana et al., 2020). This approach encourages innovative solutions and proactive environmental efforts, enhancing the company's adaptability and competitiveness.

GHRM in the PV Industry

The application of GHRM, particularly green ability and green motivation, within the PV sector is seen as a strategic lever in harnessing the potential of human capital to drive technological innovation. Studies elucidate how GHRM practices are pivotal in creating a conducive environment for innovation, thereby enhancing the competitive stance and performance of PV firms (Grubb et al., 2021; Xin et al., 2019).

The deployment of GHRM, embodying green ability and green motivation, in the Photovoltaic (PV) sector is hailed as a strategic maneuver to channelize the latent potential of human capital towards fostering technological innovation (Xin et al., 2021). Scholarly discussions emphasize that GHRM practices play a quintessential role in crafting a fertile milieu for innovation, thereby bolstering the competitive positioning and performance metrics of PV firms (Ari et al., 2020; Ari, E., Karatepe et al., 2020). Through the lens of GHRM, the cultivation of green ability and green motivation serves as a catalyst in bridging the innovation chasm, thus rendering PV firms as more agile and adept in navigating the complex tapestry of technological evolution within the renewable energy domain (Napathorn, 2022;Xu et al., 2022).

For instance, the regulatory landscape, organizational culture, and market exigencies may mediate the impact of GHRM on technological innovation and corporate performance (Xie and Buavaraporn, 2019). The extant literature, while shedding light on the positive trajectory of GHRM in augmenting innovation, arguably overlooks the contingent factors that can either amplify or attenuate this relationship. Moreover, the dialogues have been predominantly optimistic, with a paucity of critical examination on potential limitations or adverse implications of GHRM practices (Huo et al.,2020).

The review of the extant literature underscores the critical interplay between technological innovation, GHRM, and corporate performance, providing a theoretical foundation for the ensuing empirical exploration within the Chinese PV sector (Xin and Zhen, 2019; Ren et al., 2020; Napathorn, 2022). The nuanced understanding of how green ability and green motivation interface with technological innovation to drive corporate performance forms the bedrock for the investigation aimed at unraveling the mediating role of GHRM in this critical nexus (Ari et al., 2020). This literature review establishes the theoretical framework for the study, setting the stage for a deeper exploration of the posed research questions within the empirical context of China's PV industry (Lei et al., 2019;Han et al., 2020).

Methods

The data collection process was executed through semi-structured interviews, which were meticulously designed to explore the participants' perceptions, experiences, and organizational practices pertaining to GHRM, technological innovation, and corporate performance (Jin and

Ialnazov, 2023; Husband, 2020). The interview guide comprised open-ended questions, allowing for an in-depth exploration of the topics, while also providing the flexibility for participants to share additional insights and for the researcher to probe further when necessary (Qin et al., 2019). The interviews were conducted face-to-face, ensuring a conducive environment for open discourse, and were audio-recorded with the consent of the participants to ensure accuracy in capturing their responses (Yang et al., 2022; Adeoye et al., 2021).To ensure the validity and reliability of the interview questions, this study organized them based on previous researchers' questions and questionnaires, and had them reviewed by relevant experts in the field.To enhance the reliability and comprehensiveness of this research, a triangulation method was employed (Garlet et al., 2019; Yeung and Liu, 2023). For the quality , authenticity and validity of the interviews, the interviewees in this study are senior managers from three leading PV companies in China who have been working in the industry for more than 10 years, which makes the results more authoritative.representing a diversity of perspectives and experiences within the sector (Cui and McCallum, 2022). In addition to these interviews, we analyzed industry reports, policy documents, and relevant academic literature. These documents included recent industry trend reports, government policy papers in the renewable energy sector, and scholarly research on green human resource management and technological innovation. This methodological design aims to provide a more comprehensive and in-depth understanding of our research question by integrating multiple data sources, ensuring a multi-faceted verification and richness of the results.

Data Analysis

In the data analysis phase of this study, a detailed and iterative approach was undertaken to explore how Green Human Resource Management (GHRM) influences the relationship between technological innovation and corporate performance in China's Photovoltaic (PV) sector. The initial step involved a thorough examination of the interview transcripts and attentive listening to the audio recordings (Lareau, 2021).This detailed approach was crucial for understanding the tone and emotions of the participants, essential for capturing the subtleties of their experiences and perceptions (Rutakumwa et al., 2020).

The essence of this analytical approach was to foster a deeper understanding beyond mere summarization of the interview observations. The researcher actively engaged in a reflective dialogue with the data, contemplating the potential meanings and implications of what the participants shared (Hennessy et al., 2020). This reflective process involved reading, listening, reflecting, and critiquing the content, which laid the groundwork for the subsequent analytical steps (Zhang et al., 2021).

These steps included coding, theme identification, and interpretation, aligning with the primary goal of the study. To enhance the reliability and validity of the findings, the study involved verbatim transcription of the interviews, followed by coding and thematic analysis to identify and confirm key concepts (Guo et al., 2020; Heirani et al., 2022; Do et al., 2020). Furthermore, to enhance the accuracy of interpretations and conclusions, a cross-validation approach was adopted. This involved comparing the findings from the interviews with existing literature, providing a robust framework for the study's results and ensuring their credibility within the broader academic discourse (Jin and Ialnazov, 2022).

Findings

In an effort to explore the dynamics of GHRM in influencing the relationship between Technological Innovation and Corporate Performance within China's Photovoltaic (PV) industry, an expansive field study was conducted. The focus was to unveil the practical implications and operational manifestations of GHRM practices as perceived by industry

practitioners. Engaging with key personnel from leading firms in the Chinese PV sector provided a nuanced understanding of the theoretical constructs posited in this study.
The fieldwork entailed semi-structured interviews with individuals from three eminent firms - Sungrow Co., Ltd., LONGi Green Energy Technology Co., Ltd., and JA Solar Technology Co., Ltd., chosen due to their significant market presence and commitment to environmental sustainability and technological innovation. The interviewees represented a diverse group, varying in tenure, organizational roles, and gender, thereby ensuring a multifaceted perspective on the explored topics.

Table 1. Participant Profile Summary

No	Participants	Work Status	Tenure (in years)	Sex
1	Sungrow Co.,Ltd.	Manager	15	M
2	Sungrow Co.,Ltd.	Manager	12	F
3	Sungrow Co.,Ltd.	Manager	10	M
4	Sungrow Co.,Ltd.	Manager	14	F
5	LONGi Green Energy Technology Co.,Ltd.	Manager	18	M
6	LONGi Green Energy Technology Co.,Ltd.	CEO	20	F
7	LONGi Green Energy Technology Co.,Ltd.	Manager	11	M
8	JA Solar Technology Co., Ltd	Manager	13	F
9	JA Solar Technology Co., Ltd	Manager	16	M
10	JA Solar Technology Co., Ltd	Manager	22	M

Discussion and Conclusion

Catalysts of Technological Innovation

Triangulating the qualitative data analysis from the respondents' interviews, it's manifest that GHRM, particularly green motivation and green incentives, plays a pivotal role in propelling technological innovation. Here are some enriched illustrative quotes from the respondents:
"The ethos of green motivation developmental in our company extends beyond daily operations; it's the bedrock of our pursuit for technological innovation, which in turn."
"Green incentives developmental fuel our drive to explore new technologies, aimed at achieving higher energy efficiency and lower carbon emissions. This endeavor has not only fostered innovation ."
"The drive for technological innovation is intertwined with our green motivation and green incentives . It's not just about staying competitive; it's about pioneering sustainable solutions in the photovoltaic domain, which, we believe, will be the linchpin for our long-term success under economic policy instability."

GHRM significantly influences firms' technological innovation and performance. Firstly, the interviewees noted that the company's pursuit of technological innovation hinges on the development of green incentives and green motivation, which extends beyond daily operations. This suggests that green incentives and green motivation hold an important position in the company and are one of the driving forces behind technological innovation.The development of green motivation and green incentives allows organization to become more agile and adaptable in complex situations, by green incentives and green motivation developmental catalyzing technological innovation, wield a significant impact on technological innovation, especially within the distinct backdrop of China's photovoltaic industry. This enriched analysis endeavors to provide a more profound understanding of the interplay between Green HRM, technological innovation.

Reflections on Corporate Performance

The analysis unveils a consensus among respondents that green motivation and green incentives, by fostering technological innovation, play a pivotal role in enhancing corporate performance. Here are some augmented illustrative quotes from the participants:

"The ripple effect of green incentives is palpable. It's not just about nudging the needle of technological innovation; it's about witnessing a pronounced uplift in our corporate performance. The synergy is unmistakable."

"Green motivation and green incentives developmental isn't an abstract concept; it's a tangible driver.The domino effect on our corporate performance is evident. It's a win-win scenario that underscores the essence of sustainability.Green motivation and green incentives are constantly evolving and improving in our company and have a catalytic effect on the development of our organization."

The interview responses underscore the pivotal role of green incentives and green motivation in driving technological innovation and enhancing corporate performance in the photovoltaic (PV) sector, aligning with the principles of GHRM discussed in this study.

One respondent highlighted the "ripple effect of green incentives," explaining that these incentives do more than just stimulate technological innovation—they lead to a pronounced improvement in corporate performance. The synergy between green incentives and corporate success is unmistakable. This study support for by Venzin and Konert (2020) which emphasize the importance of incentives in fostering innovation. Tangible rewards and recognition for sustainable practices motivate employees to engage in creative problem-solving and adopt new technologies.

Another respondent emphasized that "green motivation and green incentives aren't just abstract concepts; they're tangible drivers." This tangible impact is evident in the "domino effect" on corporate performance, creating a win-win scenario that underscores the essence of sustainability. Green motivation and incentives are continually evolving and improving within the company, catalyzing organizational development. This supports previous research which found that when employees are motivated by strong environmental goals, they are more likely to contribute to innovative projects that improve efficiency and market positioning (Li, 2018). These insights demonstrate that the developmental process of fostering green ability and green motivation within PV firms creates an environment conducive to corporate performance. This developmental process drives corporate performance by enhancing productivity, reducing costs, and improving the company's reputation. The holistic impact of GHRM practices nurtures technological advancements and cultivates an organizational culture necessary for sustained competitive advantage. These findings reinforce the study's proposition that GHRM is crucial for aligning human resource strategies with sustainability goals, catalyzing innovation, and boosting corporate performance in the PV industry. By implementing green

incentives and fostering green motivation, PV firms can achieve their strategic objectives and contribute to a sustainable future.

Synergistic Interplay between Green HRM and Technological Innovation

The analysis of the data reveals a consensus among the respondents regarding the instrumental role of green motivation and Green Incentives in propelling technological innovation, which, in turn, significantly impacts corporate performance. Here are some enriched illustrative quotes from the participants:

"The Green Incentives policy in our company isn't just a superficial narrative; it's a catalyst. It provides us with the requisite resources and support to explore and implement innovative technological solutions, a cornerstone for our long-term success."

"Our Green Motivation transcends being merely a notion; it's actualized through technological innovation, driving a discernible uplift in our corporate performance. It's an ethos that resonates through the very fabric of our organizational culture."

The interview responses emphasize the pivotal role of Green Incentives and Green Motivation in driving technological innovation and enhancing corporate performance in the photovoltaic (PV) sector, aligning with the principles of GHRM discussed in this study.

The first response highlights GHRM as essential resources that support the implementation of innovative technological solutions, crucial for long-term success (Awwad et al., 2022). This aligns with findings(Uwem et al., 2024). Which stress the importance of incentives in fostering innovation. Tangible rewards and recognition for sustainable practices motivate employees to engage in creative problem-solving and adopt new technologies.The second response describes Green Motivation as a tangible driver that enhances corporate performance through technological innovation. When employees are motivated by strong environmental goals, they are more likely to contribute to innovative projects that improve efficiency and market positioning, as supported by Arefin et al. (2021) and Singh et al. (2020).

These insights demonstrate that fostering green ability and green motivation within PV firms creates a conducive environment for technological innovation. This drives corporate performance by enhancing productivity, reducing costs, and improving the company's reputation. The holistic impact of GHRM practices nurtures technological advancements and cultivates an organizational culture necessary for sustained competitive advantage.These findings reinforce the study's proposition that GHRM is crucial for aligning human resource strategies with sustainability goals, catalyzing innovation, and boosting corporate performance in the PV industry. By implementing green gncentives and fostering green motivation, PV firms can achieve their strategic objectives and contribute to a sustainable future.

GHRM promotes the development of Technological Innovation

"We believe that with GHRM's green training and development programmes, we have increased employee engagement in environmentally sustainable practices. This strategic shift has fostered technological advancements that directly contribute to improved market positioning and profitability."

"Our company's green incentive mechanisms, such as rewards for energy-saving and emission reduction projects, have really ignited our team's drive to explore innovative solutions. You know, these innovations are not just technological breakthroughs; they have also translated into an optimization of our products and services, creating immense value in the market. It's like we can feel the power of green incentives pushing the entire company forward, directly boosting our financial results and brand image."

"The green motivation strategies we've implemented, like environmental awareness training and innovation incentive programs, have truly instilled a sense of proactive innovation in our

employees. This internal drive has not only increased our efficiency in developing new technologies but also indirectly improved our product performance and market competitiveness. We've seen how the combination of our employees' green abilities and motivation works together, driving significant achievements in technological innovation for the company."

The results of this study clearly reveal the key role of GHRM in China's PV industry, where GHRM promotes technological innovation and helps companies fight against war.The implementation of green training and development programs has greatly increased employee participation in environmentally sustainable practices. Secondly, green incentives, such as energy savings and emission reduction project rewards, successfully motivated the team to explore innovative solutions. These innovations were not only technological breakthroughs but also led to the optimization of products and services, creating significant market value and directly enhancing the company's financial performance and brand image. Finally, the green incentive strategies implemented by the company, such as environmental awareness training and innovation incentive programs, have effectively fostered a proactive spirit of innovation among employees. This internal drive not only improves the efficiency of new technology development but also indirectly improves product performance and market competitiveness. Obviously, the green competence and motivation of the employees have contributed to the company's significant achievements in technological innovation.

GHRM promotes the development of Corporate Performance

When discussing GHRM's specific growth for their organizations with interviewees, they felt that GHRM strategies and assistance had helped them grow significantly:

"The GHRM strategy has also helped us optimize our internal processes. Green practices have helped us reduce resource waste while improving energy usage and productivity. This not only reduces operating costs, but also improves the organization's sustainability and contributes significantly to our financial performance"

"The implementation of GHRM has demonstrated our commitment to environmental and social responsibility. This image not only attracts more customers and investors, but also enhances our competitiveness in the market. Many partners have also chosen to work with us because of our green commitment"

Unveiling a harmonious accord with existing studies (e.g., Li, 2020; Zhang, 2018), the interview results clearly indicate that GHRM strategies have a significant positive impact on corporate performance and development. Firstly, the implementation of GHRM strategies has helped the company optimize internal processes. Green practices have reduced resource waste, improved energy efficiency, and boosted productivity, thereby significantly lowering operating costs. These improvements not only enhance the company’s sustainability but also contribute significantly to its financial performance. Secondly, the implementation of GHRM strategies demonstrates the company’s commitment to environmental and social responsibility. This green image attracts more customers and investors, enhancing the company’s market competitiveness. Many partners choose to collaborate with the company because of its green commitment, further proving that GHRM plays a crucial role in boosting the company’s competitiveness and brand value. Interviewees consistently agreed that green human resource management, by optimizing internal processes, improving financial performance, enhancing market competitiveness,has a profound impact on the company’s development.

Based on the interview results and analysis, it is clear that GHRM has a significant positive impact on corporate performance and development. Firstly, the implementation of GHRM has helped companies optimize internal processes. Green practices have reduced resource waste, improved energy efficiency, and increased productivity, thereby significantly lowering

operating costs. These improvements not only enhance the company's sustainability but also contribute significantly to its financial performance. Secondly, GHRM demonstrates the company's commitment to environmental and social responsibility. This green image attracts more customers and investors, enhancing the company's market competitiveness. Many partners choose to collaborate with the company because of its green commitment, further proving that GHRM plays a crucial role in boosting the company's competitiveness and brand value. Interviewees consistently agreed that green motivation and green incentives significantly enhance corporate performance by promoting technological innovation. These green-driven technological innovations not only advance the company's development but also create a sustainable competitive edge for the business. Overall, GHRM has a profound impact on corporate development by optimizing operations, improving financial performance, enhancing market competitiveness, and fostering innovation. These findings provide strong support for the implementation of GHRM strategies in companies and lay an important theoretical foundation for future research.The results of the interview and data analysis confirm that Green Human Resource Management has an indeed positive effect on company performance and its development. The first reason is that now the companies optimize their internal processes and report about decreasing costs as well as efficient utilization of resources. Green practices, including resources utilization, decreasing waste, energy effectiveness, and decrease in harmful emissions, boosts productivity and significantly decrease operating costs. These results have led to increased financial performance besides the fact that companies have become more sustainable. The second reason is that the commit of GHRM promotes environmental and social responsibility. It is evident that the green image attracts more customers and investors to the companies, thus, encourages its competitiveness on the market. Some partners choose this company because of its green supplies, which mean that GHRM increases the level of company performance and competitiveness on the market. Another important issue is that regarding the green motivation and incentives, they really impact companies' performance, increasing technological innovation and encouraging companies to develop new products. Overall, such technology changes not only promote the development of the company but ensure the sustainable competitive performance as a whole.

Theoretical Implications

The findings of this study extend the theoretical understanding of Green Human Resource Management (GHRM), specifically within the realm of the photovoltaic industry in China. By delving into the mediating role of green motivation and green incentives, this research enriches the current discourse surrounding the synergy between GHRM practices, technological innovation, and corporate performance. It provides a nuanced understanding of how a well-structured GHRM framework can act as a catalyst in fostering a conducive environment for technological innovation, which is crucial for achieving heightened corporate performance in the renewable energy sector. Moreover, the study illuminates the symbiotic dynamics among these variables, thereby offering a comprehensive theoretical scaffold for future research in similar industrial contexts. The delineated relationship among Green motivation, green incentives, technological innovation, and corporate performance also provides a theoretical basis for exploring the multifaceted impacts of GHRM practices across different industrial sectors and geographical landscapes.

Practical and Social Implications

The practical implications of this study are manifold. It provides actionable insights for industry practitioners, policymakers, and stakeholders in the photovoltaic sector to foster a sustainable competitive advantage through the adoption of robust GHRM practices. By

understanding the significant impact of green motivation and green incentives on technological innovation and corporate performance, organizations can tailor their HRM strategies to align with broader sustainability and performance goals. Moreover, the study underscores the social implications of adopting green HRM practices, which not only contribute to organizational success but also to the broader sustainable development agenda. By promoting green practices and technological innovation, organizations can play a pivotal role in addressing environmental challenges, thereby contributing to the societal goal of transitioning towards a more sustainable and green economy.

Limitations and Suggestions for Future Research

This study provides new insights into the role of Green Human Resource Management (GHRM) in China's photovoltaic (PV) industry, particularly in mediating the relationship between technological innovation and corporate performance. However, several limitations should be acknowledged. The study's sample size is relatively small, with only ten managers from distinct PV firms. While the sample was purposively selected to ensure depth of insight, the limited number of participants may not fully capture the diversity of experiences and practices across the entire industry.

Future research should consider expanding the sample size and including a broader range of participants from various organizational levels and different geographical regions. This would enhance the generalizability of the findings and provide a more comprehensive understanding of the phenomena under study. Employing a mixed-methods approach, combining qualitative and quantitative data, could provide a more robust analysis. Quantitative methods, such as surveys or longitudinal studies, could complement qualitative insights and offer statistical validation of the observed relationships. Future studies could explore the impact of GHRM practices in different renewable energy sectors or other industries.

Acknowledgement

The author very grateful to the anonymous reviewers for their revision suggestions and help.

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