



The influence of green human resource management on employees' green innovation behavior: The role of green organizational commitment and knowledge sharing

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ABSTRACT

Employees' green innovation behavior is a key factor in enterprises' promotion of green development strategies. Combining social information processing and social exchange theory, this article considers workers' green organizational commitment (GOC) as a mediating construct and knowledge sharing as a moderating construct and establishes a model of the influence of green human resource management (GHRM) on workers' green innovation conduct in company settings. An empirical analysis of 436 employees from 28 high-tech enterprises in Fujian Province shows that GHRM has a positive significant bearing on workers' green innovation conduct. Employees' GOC has a positive mediating influence on the interaction between GHRM and employees' green innovation conduct. Employees' knowledge sharing moderates positively the interaction between green organizational commitment and green innovation behavior and moderates the mediating effect of green organizational commitment. Therefore, we propose stimulating employees' green innovation behavior by implementing green GHRM, focusing on green demand and creating a knowledge-sharing atmosphere.

1. Introduction

Innovations in scientific and technology are the fundamental drivers of industrial modernization and play a vital part in stimulating high-quality economic development. However, innovation in technology has also resulted in resource and environmental problems. Technological innovation has caused the pollution of water, soil, and air in China [1]. Enterprises have an insufficient understanding of the negative externalities of technological innovation, showing a structural imbalance in the innovation value system. They pay too much attention to short-term effects, such as the increase in output scale and labor productivity, while ignoring their sustainable development. Chinese enterprises need to abandon the traditional innovation model and implement green-oriented technological innovation to achieve high-quality expansion and advance sustainable competitive benefits. Green innovation is described as innovations in hardware and software connected to green products and procedures, such as technological innovations in green service design, energy conservation, avoidance of pollution, recycling of waste, and corporate environmental management, to meet corporate social responsibility requirements, such as environmental protection [2]. Companies that promote green innovations can effectively utilize their resources and attain improved corporate identity and market share, and it is imperative for companies to implement

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green innovation. It is well-known that individuals in corporate companies have distinctive concepts and recommendations to aid to resolve all key problems, and at the same time, they effectively deal with all corporate issues. Therefore, corporate innovation ultimately comes down to the work of employees, that is, employee GIB (green innovation behavior), which is described as the conduct of employees who propose novel concepts, adopt fresh approaches, or introduce innovative systems to promote corporate green innovation in improving environmental protection and resource conservation [3]. Employees' GIB directly affects the organizational performance of green innovation. Therefore, how to effectively implement green innovation management and stimulate employees' GIB has become an unavoidable and important issue for enterprises to promote green innovation strategy.

The relevant research has focused on GIB from the perspective of organizations, and its influencing factors have included environmental regulations; nevertheless, limited research works have examined the formation mechanism of GIB from the individuals perspective [4]. The basis of organizational innovation performance is individual innovation behavior, and frontline employees' GIB is a vital source of corporate green technological innovations performance. The execution of a company green innovation policy depends on the specific processes, methods, and actions of employees' green innovation [5]; therefore, individual green innovation initiatives cannot be ignored. Including both organizational and individual elements in the study framework of green innovation will enhance the effective management of employees' GIB. By combing the existing literature, it is found that the influencing factors of individual GIB include individual characteristics, team leadership, and organizational management. For example, employee green passion is an important individual factor affecting GIB [6]; green transformational leadership style is an important team factor [7], and GHRM (green human resource management)- an organizational factor—has enticed substantial response [8]. GHRM is an evolving theory in around the world, and its commerce procedures are critical for improving sustainability in organizations and “going green” actions [9]. In developing countries, researchers have identified the output and magnitudes of GHRM at the organizational and individual levels as a crucial consideration. Comparatively, research from a GHRM perspective is still in its infancy [10]. GHRM plays a key part in managing the environment via the successful execution of suitable work-connected behaviors and suppleness among workers [11]. Ghouri et al. (2020) suggested intensely that GHRM can facilitate the acceptance of ecofriendly practices through the formation of a supportive culture and capacity building [12]. Gim et al. (2022) indicate that some organizations have not implemented a complete variety practices of GHRM [8]. Zhang et al. (2019) investigated five types of GHRM practices in a quantitative study in China, namely education and training, rewards, employee empowerment, managerial engagement, and worker life progression, on green environmental conduct in the workstation [13]. Aftab et al. (2023) argue that green innovation, environmental strategies, and pro-environmental behaviors promote the interaction between GHRM and environmental performance in manufacturing in emerging nations [14].

Research has shown that employees' organizational commitment can promote individual innovation behavior [15]. GHRM practices help build or strengthen organizational commitment (OC); thus, employees believe that an organization is committed to protecting the environment throughout its operations; for example, employees contribute to the organization's green development through their commitment and involvement [16]. The aspiration to endure as member, the readiness to spend noteworthy effort on its behalf, and the recognition of a particular organization's values and goals is described as Commitment to an organization [17]. The significance of OC is in its direct influence on consequences such as performance and active citizenship. In addition, high OC allows workers to understand how their labor matches their standards and principles.

Regarding the transformation process from organizational commitment to individual innovation behavior, some scholars believe that knowledge sharing (KS) is an important boundary condition, suggesting a positive significant correlation between KS and innovation performance [18]. As the core of knowledge management, KS significantly affects innovation [19]. Opinion sharing and acceptance may affect the impact of individual minds and consequently influence innovations via relational interactions [20]. Distinctive knowledge sharing will assist people to recombine prior concepts, utilized them to current work, and develop solutions that are new.

1.1. Research gap

Studies in this area have emphasized that GHRM practices can stimulate environmental performance by promoting green behaviors among employees in the workplace [21,22]. Despite these research works, gaps in the literature are obvious. This article fills a gap in the literature regarding green innovation on GHRM. First, literature have highlighted that this interaction has rarely been empirically verified, and the landscape of this relationship has remained mostly undetermined. This study empirically tests this aspect and provides conclusive results. Second, the understanding and application of GHRM in China and its impact on achieving green performance goals are inadequate. This study develops GHRM and employee GIB scales suitable for Chinese scenarios, deepening exploration on the practice of GHRM and green innovation in China. Third, prior literature have examined the connection between GHRM and individual GIB, but the influencing machinery between these two variables remains unclear, and the boundary conditions under which they act have not been fully discussed [23]. This article is the first to measure the mediating role of organizational commitment in the interaction between GHRM and employees' GIB, as well as the moderating role of KS between them.

1.2. The research objectives

This study had three objectives. The first objective examines the significance of GHRM and its influence on employees' GIB. The second objective was to measure the mediating role of green organizational commitment (GOC) between GHRM and employees' GIB. The third objective was to measure the moderating role of KS between GHRM and employees' green innovative behavior. Limited literature have concentrated on the role played by the HRM scheme in organizations to achieve environmental sustainability [24].

GHRM practice may influence individual GIB through the mediating or moderating influence of green mindfulness and green self-efficacy [25]. However, the in-depth investigation of GHRM is nascent [5]; therefore, the overall goal of this study includes both theoretical and practical solutions. In theory, it provides future researchers with ideas to clarify the interaction between GHRM and employees' GIB, and in practice, it provides industry managers with reference measures for GHRM and employees' innovation management.

1.3. Research questions

To accomplish the goals of article, the research was designed to deal with the research questions outlined below:

- Does a positive correlation exist between GHRM and employees' GIB?
- In an enterprise, do employees' environmental commitment to the organization and willingness to play a role in realizing the organization's green goals promote green behavior in their work innovation?
- In green innovation, will the learning and sharing of information and experience such as "two-carbon" goals, environmental protection standards, and management norms affect the transformation of GOC to GIB?

1.4. The research significance and contribution

This paper is innovative in many ways and has implications (academic and managerial). For example, this article selected GOC as the intermediary variable, constructed a mechanism model of GHRM on employees' GIB, and investigated the moderating effect of KS on the transformation process from GOC to GIB. This study also provides adapted measurement scales that are unique for future research works. Researchers in the future can apply this impact-mechanism model to different industries in different geographical regions. The academic influence of this paper is that it analyzes the effect of GHRM on GIB, reveals the mechanism between them, enriches green innovation theory, and provides theoretical guidance for enterprise employees' green innovation management. This study explains the mechanism of GHRM from different theoretical perspectives, spreads the study on the interaction between OC and innovation behavior, and extends the boundary conditions of GOC transformation into GIB. At the same time, this study draws some management suggestions for reference. Managers should enhance employees' commitment to green organizations through GHRM, create a good knowledge-sharing atmosphere for employees, and promote green innovation.

The remainder of the article is presented in this order. Section 2 comprises a review of literature and conceptualization, and Section 3 contains the methods. Section 4 consists of results and discussions, and Section 5 contains conclusions and recommendations, practical inferences, limitations, and forthcoming study areas.

2. Literature review and conceptualization

2.1. Theoretical underpinning

Social information processing theory focuses on how people determine expectations, standards, and attitudes and aims to explain how the work environment affects employees' responses and work outcomes. The core view is that people are highly adaptive organisms that actively or passively collect information about their environment and process it according to certain sequential processes to regulate and control their attitudes and behavior. Recent studies have revealed that the impact of situational cues—formal or informal—is a superior driver of people innovation levels than individual dissimilarities in employees' rational abilities and personalities [26]. According to Social Information Processing Theory, staff will change the way of information processing with the change in an organizational environment, to adjust their work motivation and behavior [27]. Through training, development, salary incentives, and other means, HRM systems can make workers trust the business and improve their commitment to it. HRM practices positively impact employees' emotional commitment. Per Singh and Pandey (2020), GHRM programs generate employee commitment via several touch themes and interfaces between employees and the organization [28]. When employees are observed as green in their tasks and submissions, they are more persuaded to accept green and sustainable practices. Moreover, when employees are vigorously involved in eco-friendly actions that meet their social and psychological needs to protect the environment, their commitment to their employers surges.

Per the Social Exchange Theory, when people feel an organization's care and input, they reciprocate with equal effort, and such reciprocity forms an exchange relationship between the organization and its members [29]. To reciprocate green transformational leadership, employees make green commitments and exchange green innovation performance with organizational support inputs. Therefore, GOC may be a key link between GHRM and individual GIB. When discussing the interaction between GHRM and employees' GIB, this article intends to further explore the mediating role of GOC. According to social exchange theory, staff maintain reciprocal exchange relations with others in the organization and use important resources to obtain support from others, thus increasing the performance expectations of individual behaviors [23]. Sharing green knowledge and ideas within an organization can reduce the difficulties and challenges faced by employees in green innovation and improve their expectations for the success of green innovation [30]. This article work additionally examines the moderating influence of KS on the interaction between employees' GOC and GIB.

2.2. GHRM practices and green innovation behavior

GHRM implies that enterprises integrate the concept of environmental management into the process of HRM to accomplish the business' strategic environmental plans and improve its environmental output [31]. Roscoe et al. (2019) understood GHRM as a pro-environmental behavior code or green behavior initiative developed by managers for employees [32]. Renwick et al. (2013) explained that GHRM is a rigid employee management system introduced by enterprises to realize environmental strategies, and organizations should implement these green management systems in the six functional modules of HRM [21]. Tang et al. (2018) regard GHRM as a comprehensive management system aimed at achieving enterprises' sustainable development and adopting HRM measures like green recruitment, green training, and green performance as a means to form green values for all employees [33]. Mahmood et al. (2023) measured the bearing of GHRM on sustainable organizational performance in three dimensions: green training, green welfare and salary, and green recruitment [34]. Regardless of whether it is seen from the perspective of measures or institutions, GHRM is a multi-dimensional concept, and its green structure covers multiple functional dimensions such as job design, recruitment, training, assessment, salary, and participation [12,35]. As for GIB, most respondents believe that staff consciously put forward or learn from creative ideas in the workplace and work processes and put them into action so that their work can contribute to resource conservation and environmental protection or meet ecological standards. Employees' GIB can reduce the damage to the natural environment caused by enterprise activities [36], save the raw materials required for production and office materials consumed by activities [37], improve enterprises' environmental performance [38], and ultimately increase their economic benefits [39].

Furthermore, the social information processing theory stipulates that GHRM enables workers to live in a green atmosphere, store green knowledge in their memory, take the initiative to retrieve relevant information, and make innovative green decisions and behaviors at work [40]. Kara et al. (2023) believe that GHRM plays a partial mediating role in the effect of organizational sustainability on employee innovation behavior [41]. Therefore, it can be inferred that GHRM will have an impact on employees' GIB. First, enterprises consider green ideas and knowledge as an important screening criterion when recruiting employees, which can attract more employees with green innovation consciousness to join the enterprise and convey the green values of the enterprise to the employees [42]. Second, enterprises provide green knowledge and skill training to employees, which enhances their green competence and self-efficacy, improves their probability of success in green innovation, increases their expectation of green innovation, and is conducive to generating green innovation motivation among employees [33]. In addition, enterprises incorporate green indicators into employees' performance assessments and link them with salaries so that employees can be motivated by green innovation and further strengthen their motivation for green innovation [43]. Finally, empowering leadership has a significant positive drive on workers' GIB [44], and the enterprise gives green authorization to employees, permitting them to partake in the decision-making procedure of the organization's green development. In this way, employees can actively combine their personal goals with the organization's green development goals and endeavor to achieve green innovation in their work. Therefore, we propose H1:

H1. A significant positive relationship exists between GHRM and employees' GIB.

2.3. GHRM and green organizational commitment

GOC is a person's trust in a business's green value. Shoaib et al. (2021) believe that the psychological commitment of employees to maintain green behaviors in the organization reflects an individual's willingness to contribute to the comprehending of the business' green strategic agenda [45]. The core idea of social exchange theory is the principle of mutual benefit. The relationship between organizations and employees is essentially a reciprocal exchange relationship, and a mutually beneficial exchange is formed between organizational support and employee commitment [46]. Therefore, it can be inferred that GHRM improves employees' commitment to green organizations. Green HRM provides green organizational support for employees, including green production technology, green product skill training, green working environment, and other resources, so that employees trust the enterprise and form the will to integrate green elements into their work [23,47]. On the other hand, enterprises can design a salary structure targeting green performance and promise employees the right to participate in green innovation and corresponding intellectual property rights, which can bring good return expectations for green innovation to employees and enhance their psychological commitment to continue green innovation [48]. Consequently, H2 was advanced.

H2. A significant positive relationship exists between GHRM and GOC.

2.4. Green organizational commitment and green innovation behavior

According to Bibi et al. (2019), employees' organizational commitment is not only manifested by their willingness to become members of the organization and their trust in the values of the organization but also by their psychological preparation for continuous hard work to achieve goals [49]. This kind of preparation plays a substantial role in GIB. Song et al. (2023) discovered that interactions between GHRM and workers' green innovative conduct were mediated by environmental self-efficacy, the intention of green behavior, and the company's green environmental conduct [50]. GHRM provides the situation and opportunity for employees' GIB; however, the existence of green innovation opportunities does not directly bring about GIB. The occurrence of GIB depends on the psychological will and preparation of green innovation, namely, the intensity of GOC. Therefore, employees' GOC has a significant positive drive on GIB. Innovation is a complex activity that requires sufficient knowledge reserve and early accumulation. The stronger an employee's commitment to a green organization, the stronger the motivation to obtain and apply green knowledge and skills, the more green ideas will accumulate, which, to a certain extent, will lead to the generation of GIB. Therefore, H3 and H4 were put forward.

H3. A significant positive relationship exists between GOC and employees' GIB.

H4. The relationship between GHRM and employees' GIB is mediated by GOC.

2.5. Knowledge sharing

KS is the communication behavior between the owner and demander regarding the transmission and acceptance of knowledge [51]. In an organization, individuals can share knowledge about work information or experience. KS manifests as a kind of organizational culture. Scholars have divided KS into explicit and tacit according to its content and form. The content of the former is simple and vivid, which can be standardized and programmed, and transmitted among employees through texts, images, videos, data, and other forms. The latter is complex and abstract in content; more personalized and differentiated; and needs to generate creative ideas, judgments, or ideas among employees through ideas, actions, experiences, and other forms that exist only in individual consciousness and experience [52]. Studies have shown that both explicit and implicit KS can promote employee innovation performance [53], and similar conclusions have been drawn in the arena of green innovation [54].

Per the social exchange theory, KS among employees is also a type of social exchange behavior. The more explicit KS in an organization, the more employees with strong organizational commitment will obtain sufficient information, such as technical standards and work processes, and the more complete the knowledge structure that employees need for innovation. The more tacit the KS in an organization, the easier it is for employees with a strong organizational commitment to brainstorm, generate new ideas, and respond to organizational KS through work innovation [55]. Therefore, KS can regulate the influence of employees' GOC to GIB. Green innovation involves the research, development, and production of green products, safety assurance, supply chain management, and other links, and it also considers the brand and environmental benefits of enterprises, which are more complex than traditional technological innovation. In the process of transforming employees' GOC into GIB, if the enterprise establishes a knowledge resource database, such as a green development report, green product manual, or green process guide, and often holds exchange activities, such as green development forum, green creative salon, and green knowledge training, employees can consult the information at any time and learn from the green experience, enhancing the success expectation of green innovation and strengthening GIB. In contrast, if internal information and information communication mechanisms are lacking and employees work alone, they will face the limitation of insufficient individual green knowledge reserves, and it will be difficult to put forward innovative ideas with green significance. Even if they have a high commitment to green organizations, they cannot successfully implement GIB. Consequently, H5 was proposed.

H5. KS moderates the relationship between GOC and GIB.

Following from the hypotheses above, this paper suggests the following research model (Fig. 1). Employees' green organizational commitment mediates the effect of GHRM on employees' GIB but is also moderated by KS. Specifically, the greater the existence of full KS, the resilient the influence of employees' green organizational commitment on GIB, and the stronger the influence of GHRM through green organizational commitment on employees' GIB. The less KS, the weaker the effect of green organizational commitment on GIB and intermediary GHRM on GIB. Therefore, we propose H6.

H6. KS positively moderates the mediating role of GOC between GHRM and GIB.

3. Methodology

3.1. Study design

This paper utilized a quantitative method grounded on the projected research framework. SPSS 24 and Smart PLS 4 were utilized to exam and analyze the model and data which examined the interactions (direct and indirect) within diverse constructs. A questionnaire was utilized for the primary collection of data, and it comprised two divisions. Part one was developed to acquire basic (demographics) data of the participants, such as educational background, age, gender and distribution of industries. As shown (Table 1), the nominal scale aided to evaluate demographic traits. Also, part two entailed the items that evaluated manifold variables: GHRM, GOC, KS, and GIB.

The variables measured referred to the maturity scale, and all the items were measured using a 5-point Likert scale ranging from 1 (*totally disagree*) to 5 (*strongly agree*). GHRM refers to the scale designed by Dumont et al. (2017) [56], which is measured through practices such as green goal setting, green value training, green knowledge and skill training, green performance appraisal, green salary reward, and green promotion investigation perceived by employees, with a total of six items. A sample item is "My company has set green goals for its employees." The Cronbach's α of the instrument was 0.906. GOC refers to the scale developed by Raineri et al.

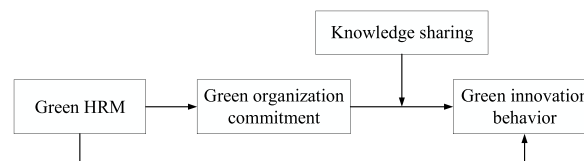


Fig. 1. Research framework.

Table 1
Demographic characteristics.

Demographic Variables		Frequency	Valid (%)
Gender	Male	262	60.1
	Female	174	39.9
Age	21–30 years	148	33.9
	31–40 years	131	30.1
	41–50 years	115	26.4
	51–60 years	42	9.6
Education	Bachelor's degree	207	47.5
	Master's degree	143	32.8
	PhD	86	19.7
Industries	electronic information	86	19.7
	biomedicine	77	17.7
	new energy and new materials	73	16.7
	advanced manufacturing and automation	97	22.2
	high-tech services	44	10.1
	other	59	13.6

(2016) [57] and measures employees' sense of belonging and responsibility for corporate green development. A total of seven questions were designed for this study. A sample item is "I am very concerned about the green development of the company." The Cronbach's α of the instrument was 0.897. KS refers to the scale used by Reinout et al. (2006) [58] and measures employees' behavioral attitudes toward knowledge contribution and knowledge collection in the organization, with a total of six items designed. A sample item is "When I learn new knowledge and skills, I will tell my colleagues." The Cronbach's α of the instrument was 0.914. GIB refers to the scale designed by Zhang et al. (2018) [59] and is measured by green process improvement activities such as energy saving and emission reduction conducted by employees at work, with a total of four items designed. A sample item is "I often come up with green ideas to reduce waste and harmful emissions in my work." The Cronbach's α of the instrument was 0.854.

3.2. Respondents and sample

We primarily targeted companies that not only had an alertness of and have executed green innovation plans in the technology center or R&D department but also trained their workers to apply green innovation processes in their jobs. The responses were gathered from their workers through a self-administered method. The sample of this study is the national high-tech enterprises with ISO14001 certification in the Fujian Province of China, which comprises structured organizations that chart green HR practices and eco-friendly environments. High-tech enterprises actively participate in green innovation, and businesses with ISO14001 certification are more likely to implement GHRM. The sample for the research was restricted to the designated research topic; thus, we used purposive sampling to get the answers from the sampling structure and sanction that cognizant consent had been acquired from all respondents. The survey objects were employees of the enterprise technology center or R&D department, and the survey method was a field survey (physical distribution of questionnaire). With the permission of the business manager and the help of the human resources staff, the field survey was conducted by students of Fujian Jiangxia University, who went into the enterprise to administer the questionnaires after being adequately trained on the questionnaires' content and how to administer them. This was done to ensure that the recruited students could properly administer the questionnaires to the targeted population and elicit quality responses. The purpose, use, and content of the survey instrument were elucidated to the respondents. After the respondents understood the purpose and content of the questionnaire and agreed to participate, paper questionnaires were formally issued to them. The survey was conducted between September and November 2022, and 500 questionnaires were sent out to 28 high-tech enterprises; 451 were recovered, and questionnaires with incomplete information were excluded (including missing demographic and variable question item information). After eliminating unacceptable questionnaires, 436 useable questionnaires were attained, with an effective recovery rate of 87.2%. Research concerning human partakers were appraised and sanctioned by Fujian Jiangxia University's Academic Subcommittee of the School of Business Administration. Precautionary measures, such as leaving the constructs untitled, guaranteeing participants of their concealment, not demanding any private data, and pursuing deliberate involvement, were commenced to minimize self-reporting bias. We informed respondents of their intentions prior to the investigation. Informed assent was acquired from all the respondents took part in this research work. Thus, respondents participated voluntarily and completed the questionnaire anonymously.

3.3. Estimation techniques

In this article, the research tools were segregated, such that severe analytical results to attain the research objectives and get answers to the evaluated research questions. The PLS-SEM is most appropriate than covariance-based equation modeling (CB-SEM) based on the ensuing circumstances: the aim is to commence exploratory investigation for theory advancement; the structural model is complicated and contains one or more formative constructs, and normality for distribution is lacking [60]. Therefore, the PLS-SEM functioned to evaluate the multifaceted cause-effect connection models with latent constructs. The PLS-SEM procedure with Smart-PLS 4 efficiently measured the causal-effect associations offered in this model as the study sample surpassed ($n = 436$) and the

normality condition was not necessary for the utilized technique and software. To evaluate the structural model, Hair et al. (2017) suggested observing at the R2, beta (β), and the equivalent t-values via a bootstrapping process with a resample of 5000. We measured moderation or moderated mediation via the bootstrapping method with 5000 bootstraps [61]. Smart-PLS 4 computes the bootstrapping technique by default; nevertheless, in AMOS, this command must be given, which is also built-in by default in conditional system modeling.

4. Results and discussions

4.1. Demographic information

As displayed (Table 1), a nominal scale was used to evaluate demographic characteristics. 60.1 % (n = 262) of the participants were men, and 39.9 % (n = 174) were women. The high proportion of male participants resulted from their percentage in high-tech enterprises, which was higher than that of their female counterparts. As in most countries worldwide, men outnumber women in technological innovation activities in China; however, this is gradually changing, with women playing an increasingly important role in technological innovation. Most respondents (33.9 %, n = 148) were aged between 21 and 30 years, while only 9.6 % (n = 42) were aged over 51 years. Most scientific and technological personnel are young and may show an interest in GIB. Concerning the participants' education level, most were graduates (47.5 %, n = 207), with only 19.7 % (n = 86) had PhD degrees. This indicates that employees engaged in science and technology innovation are generally highly educated and more receptive to green development. The distribution of industries is also diverse: 19.7 % (n = 86) of the respondents worked in electronic information, 17.7 % (n = 77) in biomedicine, 16.7 % (n = 73) in new energy and new materials, 22.2 % (n = 97) in advanced manufacturing and automation, 10.1 % (n = 44) in high-tech services and 13.6 % (n = 59) in other fields. The diversity of industry distribution enables a broader generalization of our study.

4.2. Descriptive statistics

The mean and standard deviation (descriptive statistics) for each variable are displayed in Table 2. The mean value of GIB reached 3.921, indicating that the respondents were more willing to implement green innovation in their work. Higher standard deviation values sustained the dispersion of sample scores, demonstrating that the data were not clustered mainly around the mean.

4.3. Validity and reliability

Table 2 presents the Cronbach's α , composite reliability (CR), and average variance extracted (AVE) values. The reliability of each scale was good, with Cronbach's α over 0.80. Based on the validity criteria recommended by Hair et al. (2021) [62], standardized factor loadings were higher than 0.6, average variance extracted (AVE) ranged between 0.618 and 0.705, and composite reliability (CR) ranged between 0.901 and 0.934. Thus, all three standards for convergent validity were achieved.

Table 2
Scale items' reliability and validity test results.

Constructs	Item Code	Factor Loadings	Mean	SD	Cronbach's α	KMO	AVE	CR
Green Human Resource Management (GHRM)	GHRM1	0.766	3.576	1.076	0.906	0.756	0.689	0.929
	GHRM2	0.906						
	GHRM3	0.613						
	GHRM4	0.826						
	GHRM5	0.902						
	GHRM6	0.924						
Green Organization Commitment (GOC)	GOC1	0.816	3.593	0.987	0.897	0.849	0.618	0.918
	GOC2	0.839						
	GOC3	0.641						
	GOC4	0.82						
	GOC5	0.772						
	GOC6	0.82						
	GOC7	0.778						
Knowledge sharing (KS)	KS1	0.734	3.118	0.753	0.914	0.803	0.705	0.934
	KS2	0.726						
	KS3	0.907						
	KS4	0.894						
	KS5	0.883						
	KS6	0.873						
Green innovation behavior (GIB)	GIB1	0.821	3.921	0.917	0.854	0.781	0.695	0.901
	GIB2	0.843						
	GIB3	0.85						
	GIB4	0.819						

4.4. Multicollinearity analysis (VIF)

The results (Table 3) show that the values of variance inflation factors (VIF) are less than 5; hence, the constructs show no possible concern of multicollinearity. The VIF values between GHRM and GIB & GOC are 1.989 and 1.000, correspondingly. Likewise, the outstanding figures of VIFs are also less than those between the elements, indicating no multicollinearity problem.

4.5. Common method deviation test

Common method variance may happen in single-source data or in cross-sectional study designs. Subsequently, Harman's one-factor test was applied to regulate whether data variance could be mostly credited to single element [63]. Since the Kaiser-Meyer-Olkin (KMO) value of each scale was >0.7 , SPSS24.0 was applied to the principal component factor analysis of the four variables. Without rotation, the first common factor explained 41.987 % of the total variation, which was below 50 %, signifying no serious common method bias among the variables.

4.6. Discrimination validity

Discriminate validity was evaluated by utilizing the Fornell and Larcker criterion and Heterotrait-Monotrait ratio (HTMT) and the results are presented in Tables 4 and 5 correspondingly. The Fornell-Larcker criterion served to relate the square root of AVE got from each notion against the variable correlation to evaluate discriminant validity. The square root of the AVE of every factor was greater than the attained correlation of the factors, which demonstrates that it was different from its interaction with other items. Hence, convergent and discriminant validity were achieved. Table 5 demonstrates that each HTMT was below 0.90, another standard to undertake discriminant validity between the two variables; consequently, the discriminant validity situation was also accomplished.

4.7. Path analysis

The structural model results established a significant connection between GIB compelled by GHRM, GOC, and KS (see Table 6). The interaction of these constructs is elucidated in Fig. 2 for SEM that recognizes the values essential to assess the effect of GHRM on employees' GIB and the mediating effect of GOC. For the hypothesis validated, we tested the t-values and p-values; the threshold values are $t > \pm 1.96$ and $p < 0.05$. If the results of the items contain these constructs, the interaction between the two constructs is significant and supported. Table 6 show that GHRM has a significant positive influence on employees' GIB ($\beta = 0.136$, $t = 3.864$, $p = 0.000$), and H1 is supported. With the mediation variables, GHRM has a significant positive impact on employees' GOC ($\beta = 0.665$, $t = 29.150$, $p = 0.000$), and H2 is confirmed. Meanwhile, GOC significantly positively affected GIB ($\beta = 0.153$, $t = 4.591$, $p = 0.000$), and H3 is supported. Finally, GOC plays a partial mediating role between GHRM and employees' GIB ($\beta = 0.102$, $t = 4.725$, $p = 0.000$), and H4 is supported. In addition, the Bootstrap method was used to test the mediating effect between employees' GOC and GIB, and it was randomly sampled 5000 times. The outcomes demonstrate that the indirect effect coefficient of GHRM on employees' GIB is 0.102, and the 95 % confidence interval is [0.059, 0.145], excluding zero. This designates that GHRM can not only directly drive employees' GIB but also indirectly drive employees' GIB via the mediating role of GOC, and H4 is further supported.

Notwithstanding the importance of GHRM in employees' GIB, this interaction is affected by KS (see Fig. 2). This study also exposed the significance of KS as a moderating variable. The moderating influence of KS on the GHRM-GIB and GHRM-GOC-GIB associations were evaluated using a two-step method to estimate the continuous moderating impact in the PLS-SEM. Following Table 6, the interaction terms of GOC and KS had a positive effect on GIB ($\beta = 0.041$, $t = 2.737$, $p = 0.022$), and the 95 % confidence interval is [0.007, 0.086], excluding zero, indicating that KS plays a positive moderating role in the effect of GOC on GIB, and H5 is supported. The simple slope analysis of this moderating effect (Fig. 3) shows that under the condition of a higher KS degree (mean plus one standard deviation), employees' GOC has a higher impact on GIB (eff. = 0.264, $t = 4.869$, $p = 0.000$), and under the condition of a low degree of KS (mean minus one standard deviation), the influence of employees' GOC on GIB is low (eff. = 0.157, $t = 2.834$, $p = 0.005$). This indicates that with improvements in KS, the influence of employees' GOC on GIB gradually increases.

Finally, the moderating influence of KS on the mediation model "GHRM \rightarrow GOC \rightarrow GIB" is tested (Table 7). The moderated mediation index is 0.128, the Boot standard error is 0.027, and the 95 % confidence interval is [0.075, 0.183], excluding zero. This designates that the moderated mediation influence is significant, and the higher the degree of KS, the more easily GHRM will affect GIB through employees' GOC. H6 is therefore supported.

Table 3
Multicollinearity statistics (VIF).

Factors	GHRM	GIB	GOC	KS	KS x GOC
GHRM		1.989	1.000		
GIB					
GOC		2.084			
KS		1.780			
KS x GOC		1.308			

Table 4
Fornel-Larcker criterion.

	GHRM	GIB	GOC	KS
GHRM	0.830			
GIB	0.608	0.834		
GOC	0.665	0.639	0.786	
KS	0.565	0.538	0.600	0.840

Table 5
Heterotrait-Monotrait ratio (HTMT) - Matrix.

	GHRM	GIB	GOC	KS	KS x GOC
GHRM					
GIB	0.683				
GOC	0.71	0.679			
KS	0.616	0.846	0.625		
KS x GOC	0.432	0.396	0.411	0.461	

Table 6
Path coefficients.

Path	Path Coefficient	Standard deviation	t-value	p-value	95 % Confidence interval	Decision
H1:GHRM -> GIB	0.136	0.035	3.864	0.000	0.068 0.206	Accepted
H2:GHRM -> GOC	0.665	0.023	29.150	0.000	0.622 0.711	Accepted
H3:GOC -> GIB	0.153	0.033	4.591	0.000	0.088 0.220	Accepted
H4:GHRM -> GOC -> GIB	0.102	0.022	4.725	0.000	0.059 0.145	Accepted
H5:KS x GOC -> GIB	0.041	0.024	2.737	0.022	0.007 0.086	Accepted

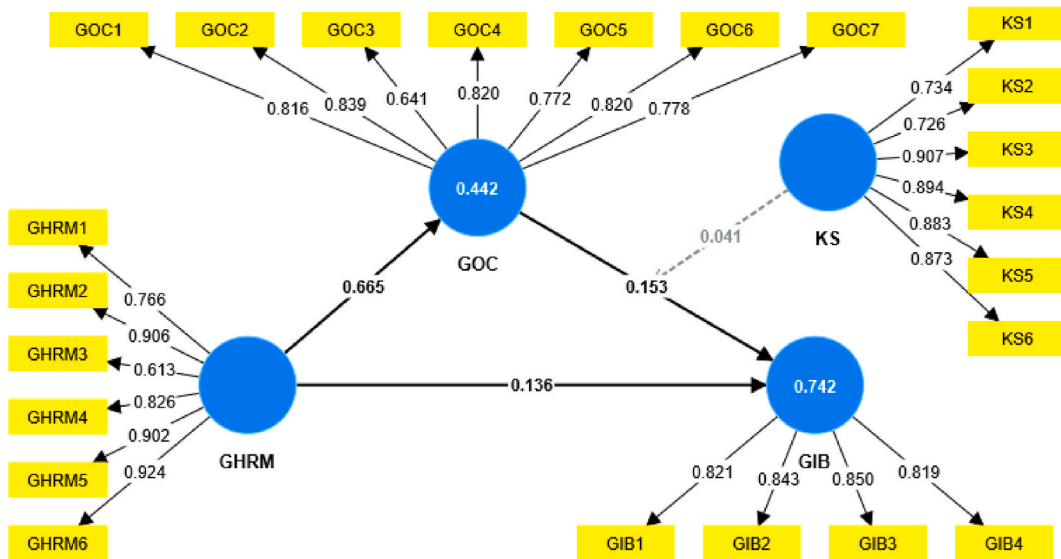


Fig. 2. Measurement model assessment.

4.8. Discussions

Using GOC as the mediating construct and KS as the moderating construct, this article develops an interaction model between GHRM and employees' GIB. This study expands the applications of GHRM. With the rise in green management research, aggregation in the number of researchers has focused on the importance of GHRM. Dumont et al. (2017) examined the interaction between GHRM and employees' green behavior using packaging enterprises as samples [56], and Naimatullah et al. (2023) empirically confirm GHRM practices and innovation in Pakistan's automobile business [64]. However, few scholars have focused on the interaction between GHRM and employees' GIB in high-tech enterprises. This study finds that GHRM in high-tech enterprises has a positive significant drive on employees' GIB, which effectively responds to Tang et al.'s (2018) proposal on enriching GHRM research samples [33], which

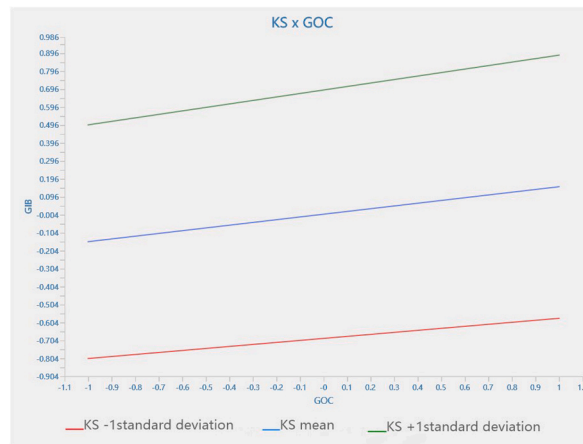


Fig. 3. Moderating influence of KS on the interaction between DOC and GIB.

Table 7
Moderated mediation test results.

	Knowledge Sharing	Path Coefficient	Standard deviation	t-value	p-value	95 % Confidence interval	
GHRM - > GOC - > GIB	3.871 (M + 1SD)	0.161	0.035	4.660	0.000	0.095	0.229
	3.118 (M)	0.128	0.027	4.745	0.000	0.075	0.183
	2.365 (M - 1SD)	0.096	0.033	2.935	0.003	0.032	0.161
Index of conditional mediation		0.128	0.027	4.745	0.000	0.075	0.183

verifies the influence of GHRM in high-tech enterprises and deepens the theory of employees’ GIB.

Furthermore, this study opens the black box of GHRM and employees’ GIB. Saeed et al. (2019), Dumont et al. (2017), and Fawehinmi et al. (2020) examined the interaction between GHRM and workers’ green behaviors from the mediating paths of pro-environment psychological capital, green psychological atmosphere, and environmental knowledge [43,56,65]; however, these studies rarely involved the perception of social exchange theory. The role of GOC—a vital construct in the influence of GHRM on employee conduct—was ignored. This study introduced GOC into the research framework and verified the mediating effect between GHRM and employees’ GIB. These results support Shoaib et al.’s (2021) [45] findings that GOC plays an important role in driving GIB in GHRM. In addition, this study helps explain the mechanism of GHRM from different theoretical perspectives and extends the research on the interaction between OC and innovation behavior, which is of key consequence for refining the analytical framework of GIB.

Finally, the boundary conditions for the transformation of GOC into GIB were extended. As for the situational variables of GHRM’s effect on GIB, Cho et al. (2021) found that individual factors, such as employees’ green passion, have a positive impression on employees’ green behavior [6]. However, Amrutha et al. (2020) believe that the drive of GHRM on workplace GIB is also influenced by organizational factors [66]. In this study, the organization’s KS atmosphere is incorporated into the study model, and the moderating effect of KS in “GHRM→ employee GOC → employee GIB” is tested, providing a more comprehensive answer for the academic community to understand the situational conditions under which the antecedent variables of employees’ GIB play a role.

5. Conclusions and recommendations

5.1. Conclusions

The empirical conclusions of this paper establish that (1) green HRM has a positive significant drive on employees’ GIB; (2) green HRM can enhance employees’ GOC; (3) employees’ GOC positively affects their GIB; (4) GOC plays a partial mediating role between GHRM and workers’ GIB; and (5) KS enhances the positive interaction between GOC and GIB and further moderates the mediating role of GOC between GHRM and GIB.

5.2. Managerial implications

This article offers practical insights for businesses to optimize green innovation management and strengthen employees’ GIB. First, enterprises should incorporate GHRM into the implementation plan of environmental strategy and formulate corresponding green measures to strengthen employees’ GIB. Enterprise managers should consider the green concept as an important criterion for employee recruitment evaluation, improve the green evaluation system of talent evaluation, clarify the green behaviors that employees should complete according to their job responsibilities, and encourage green behaviors outside the employees’ roles.

Introducing green knowledge and skills courses into the employees' training system enhances their green focus and innovation through multimedia display and case sharing. Enterprises should set green performance indicators for employees, do a good job in green performance guidance and feedback, and improve employees' green innovation performance. Moreover, they should formulate a reasonable green incentive system, combine the assessment results of green innovation performance with the employees' compensation and welfare, and serve as an important reference for job promotion.

Second, enterprises should pay attention to employees' green development needs and strengthen their commitment to green organizations. Enterprise managers should not only pay attention to employees' innovation performance but also play a leading part in green innovation and reward employees' GIB over time. Enterprises should set green development goals for employees' careers, provide skills training conducive to achieving green innovation performance, and care for employees' green lives, so that employees can fully integrate into their green development and form a high green emotional commitment. Enterprises should create a strong green innovation environment for employees, introduce the latest green equipment and technology, fully respect employees' different opinions on green innovation, let employees participate in green decision-making, and encourage employees to provide suggestions for green innovation. For example, a "Green Innovation Honor Roll" or annual "Green Innovation Star" should be established to stimulate employees' sense of responsibility for green innovation.

Finally, enterprises should create an atmosphere of KS among employees to create a good environment for GHRM and innovation. Enterprises should encourage employees to strengthen their communication of green or environmental protection information and increase their green knowledge reserves. Managers can establish internal KS platforms and mechanisms to institutionalize KS policies. Enterprises can place KS policies into the management manual for systematic publicity to allow employees' KS concepts into their minds. Enterprises should establish a culture of KS, use team discussions, green resource information databases, green innovation forums, and other ways to stimulate employees' enthusiasm for KS and encourage employees to carry out green innovation.

5.3. Limitations and future research

First, in terms of the research level, the influence of GHRM on GIB discussed in this study is limited to the individual level, which is relatively simple. Future research can be extended to the team level to discuss the mechanism of organizational GHRM on team GIB and optimize the research model. The influence of GHRM on GIB at different levels was analyzed using a cross-level research method. Second, in terms of variable selection, this article concentrates only on the mediating role of GOC and lacks studies on other mediating variables. Projected works may deliberate on introducing mediating variables, such as green mindfulness, green psychological capital, green job remodeling, and environmental protection enthusiasm, to explore the mechanism of GHRM in GIB. In addition to KS, other situational factors, such as learning ability reflecting individual characteristics and organizational atmosphere reflecting organizational characteristics, were considered as moderating variables. Third, in terms of sample data, the scope and scale of the sample area selected in this article are not large enough, and the external validity of the study inferences is limited. In the future, the investigation area can be further expanded, the scope of enterprises enriched, and the samples compared and analyzed to improve the suitability of the research and generalize the conclusions. Finally, respondents' bias, considering the position held, length of service, age, and green commitment time, may have contributed to the generation of response bias in the survey. Follow-up studies should consider these biases and minimize their impact on study results.

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Data availability statement

Data will be made available on request.

Ethics statement

Studies involving human participants were reviewed and approved by Fujian Jiangxia University's Academic Subcommittee of the School of Business Administration. Informed consent was obtained from all subjects involved in the study.

CRedit authorship contribution statement

Min Yang: Conceptualization, Formal analysis, Funding acquisition, Investigation, Methodology, Software, Validation, Visualization, Writing – original draft. **Zhongbin Li:** Data curation, Project administration, Resources, Supervision, Writing – review & editing.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing

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