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Green Synergy: The Impact of Knowledge Sharing, Green Dynamic Capabilities, and Business Model Innovation on Green Innovation in Manufacturing Enterprises

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Abstract

More enterprises are turning their attention to green innovation (GI), and business leaders have realized that it is a crucial tool to address the aforementioned environmental issues. While current literature has investigated green innovation from the perspectives of environmental taxes environmental regulations, environmental equity, trading green credit, few studies have explored the effects of business model innovation on green innovation in the context of government pressure and under conditions of uncertainty. Based on theories such as the resource-based view and dynamic capabilities, this research presents a novel framework for investigating how green knowledge sharing (GKS), and green dynamic capabilities (GDC) business model innovation (MBI) affect green innovation (GI). Data consisted of 482 respondents from Chinese manufacturing industries, and seven substantial hypotheses were verified regarding the direct, mediating effect of targeted variables in confounding ways using partial least squares structural equation modeling (PLS-SEM). The finding shows that both green knowledge sharing green dynamic capabilities and business model innovation have significant and positive impacts on green innovation. Furthermore, the influence of business model innovation on green innovation under government encouragement is crucial, which is an aspect that has been less explored in existing literature. This research validated the study hypotheses, further confirming the connections between green knowledge sharing, green dynamic capabilities, business model innovation, and green innovation. Overall, this study offers robust theoretical support and empirical evidence to comprehend and drive the development of green innovation in Chinese manufacturing enterprises.

Keywords: Green innovation, green knowledge sharing, Business model innovation, green dynamic capabilities, Manufacturing enterprises

Introduction

The Chinese manufacturing, crucial for the country's progress, is also a major cause of environmental problems like climate change, pollution, and resource depletion (Li et al., 2022). To combat this, the Chinese government has implemented policies like the Green Manufacturing Project (2016-2020) and the Double Carbon Targets from September 2020, showing a commitment to sustainability (Zhang et al., 2022; Qiu et al., 2020). Businesses are increasingly focusing on green innovation (GI) as a key way to tackle these issues, seeing it as advanced technologies that cut energy use, prevent pollution, and preserve resources (Chu et al., 2019; Xie et al., 2022). GI is seen as our best bet to save future generations from the harm caused by current practices (Ma et al., 2022).

In recent years, there has been a growing scholarly interest in the research on green innovation. While existing research mainly explores the impact of external factors such as environmental taxes (Jiang & Chen, 2018), environmental regulations (Zheng & Wang, 2014; Zhang et al., 2020), environmental equity trading (Zhang et al., 2018), and green credit (Li et al., 2019) on green innovation. There is relatively little literature exploring the impact of internal factor like business model innovation on green innovation. Green innovation is a key driving force for enterprises seeking sustainable development (Du & Li, 2019), it is important to enterprises. However, in the case of government pressure and uncertainty, not all companies strengthen green innovation from the perspective of internal business model innovation to solve the solution of business and environmental problems. For manufacturing industry enterprises, grappling with managers' limited understanding of green innovation and insufficient development of green business models poses a challenge. Constructing a green innovation mechanism reliant on business innovation, resources and capabilities becomes crucial for these enterprises to bolster their green competitiveness and advantages. Thus, based on the above discussion we raise the following

Research objectives

1.To study the levels of green knowledge sharing, green dynamic capabilities, business model innovation, and green innovation in manufacturing enterprises in China?

2. To study How do green knowledge sharing, green dynamic capabilities, and business model innovation affect green innovation in manufacturing enterprises in China?

3. To study How can the proposed framework be utilized to explain the mechanism of green innovation in enterprises?

In order to better answer the above questions, at the same time, to analyze the relationship between the green knowledge sharing, green dynamic capabilities, and green innovation, this study introduces business model innovation as a mediating variable for discussion. The research has three objectives:1) To investigate the relationship of green knowledge sharing, green dynamic capabilities, business model innovation and green innovation;2) To evaluate the validity of a conceptual framework of green knowledge sharing, green dynamic capabilities, business model innovation and green innovation.3) To explain the green innovation mechanism in manufacturing enterprises by using the proposed framework.

Literature review

More attention is directed towards green innovation as it holds immense importance for countries and companies dealing with these challenges. Current research has yielded fruitful results in two areas: factors influencing green innovation and its resulting outcomes. One branch of research examines factors like stakeholder pressure, dynamic capabilities, absorptive capacity, creative capability, technology adoption, and digitization, all contributing to fostering green innovation (Albort-Morant et al., 2018b; Yang et al., 2020; Fan et al., 2023; Yin & Yu, 2022). Similarly, studies highlight obstacles encountered in green product, process, and system innovations. Barriers include environmental resources, attitudes, perceptions, business practices, government support, customer demands, inadequate partnerships, information scarcity, and conflicting business interests (Abdullah et al., 2016).

Moreover, scholars delve into the impact of external factors like environmental taxes, regulations, equity trading, and green credit on green innovation (Jiang & Chen, 2018; Zhang et al., 2020, 2018; Li et al., 2019). Internally, factors such as green creativity, image, culture, efficiency, strategy innovation, behavior, dynamic ability, and knowledge sharing are explored for their role in driving company green innovation (Albort-Morant et al., 2018b; Yang et al., 2020; Fan et al., 2023; Yin & Yu, 2022). Research demonstrates these factors positively influence green innovation.

The second area of research focuses on the outcomes of green innovation. green innovation is crucial for achieving environmental sustainability, providing competitive advantages (Chu et al., 2019), enhancing economic performance, addressing environmental challenges, and improving performance. Additionally, it deters imitation (Albort-Morant et al., 2018b). Much research had provided the findings, for example, Innovation aims to enhance products/services for customers, resulting in cost efficiency and organizational flexibility (Albort-Morant et al., 2018a). It help mitigate environmental risks (Castellacci and Lie, 2017), enhance resource efficiency (Wang et al., 2017; Zhang et al., 2017), create eco-friendly opportunities (Albort-Morant et al., 2018b), reduce pollution rates (Albort-Morant et al., 2018b), increase recycling (Aid et al., 2017; Huang et al., 2019), save energy (Chen et al., 2017; Wang et al., 2017), gain competitive advantages (Du et al., 2018; El-Kassar and Singh, 2019), improve environmental and economic performance (Roy and Khastagir, 2016), support strategic goals (Yang et al., 2016).

In summary, regardless of the above literature branch, there is limited research that delves into the influence of business model innovation on green innovation. Furthermore, there is a scarcity of studies that investigate the mechanisms through which business model innovation affects green innovation in manufacturing enterprises. This is the starting point and the research gap of this paper. This study introduces business model innovation into the analytical framework of factors influencing the green innovation of manufacturing enterprises, which is helpful to make up for the scarcity of exploring the green innovation of manufacturing enterprises under the perspective of the business model.

Hypothesis Formulation

Current research on knowledge sharing primarily focuses on two areas: intra-organizational and inter-organizational sharing. This study, centered on established manufacturing firms, asserts their emphasis on inter-firm knowledge sharing. Building on Song et al. (2019) and Zhang (2016), green knowledge sharing is defined here within a supply chain context. It involves exchanging valuable information about eco-friendly practices among supply chain members, aiming for mutual benefit, promoting green technology development, and identifying new market opportunities (Xu et al., 2021). Importantly, knowledge sharing significantly drives green innovation (Abbas & Sagsan, 2019).

Studies show that companies enhance their environmental performance and comply better with regulations on energy consumption and waste management through sharing green knowledge (Xu et al., 2020). Moreover, multinational corporations leveraging green knowledge with supply chain partners not only promote environmental sustainability but also bolster business performance and innovation within the supply chain (Govindan et al., 2018). Therefore, the first hypothesis is as follows:

H1: Green knowledge sharing has an effect on green innovation in manufacturing enterprises.

This study defines business model innovation as the revitalization and enhancement of existing models, involving reshaping value propositions and business logic, seeking new value avenues benefiting customers, suppliers, and partners (Zott et al., 2011). Research contends that business model innovation serves as a transformational tool for firms (Demil & Lecoq, 2010; Johnson et al., 2008; Sosna et al., 2010). It spans cost reduction, process optimization, new product introduction, market expansion, or can be an innovation theme itself (Mitchell &

Coles, 2003). Successful business model innovation significantly improves firms' differentiation and enhances green innovation performance (Zhang et al., 2022).

Knowledge sharing is pivotal in managing organizational knowledge (Zulfiqar & Khan, 2021). It aims to broaden knowledge utilization and enhance its value, offering abundant intellectual capital for business model innovation (Rudawska, 2020). In the realm of open innovation, knowledge emerges as a crucial resource for driving business model innovation, urging proactive and open sharing practices. Organizations now leverage both internal and external knowledge actively (Lanlika et al., 2005). In this context, knowledge-sharing positively influences business model innovation. This study specifically focuses on green knowledge within manufacturing enterprises, emphasizing green knowledge sharing among these enterprises. Green knowledge sharing, being a subset of knowledge sharing, differs in the shared content. Hence, we propose the following hypothesis:

H2: Green knowledge sharing has an effect on business model innovation in manufacturing enterprises.

Dynamic capability theory, an extension of the resource-based view theory (Mousavi et al., 2019), elucidates how companies adapt their resources and capabilities in response to external and internal pressures (Achi et al., 2022). Robust dynamic capabilities enable companies to swiftly gather information, identify opportunities, and adapt products, services, and strategic structures (Achi et al., 2022; Yousaf, 2021; Mousavi et al., 2019). Teece (2017) highlights that the core micro foundation of dynamic capabilities lies in management's ability to develop and refine business models, known as business model innovation (Teece, 2018).

Green dynamic capability, an extension emphasizing sustainable development, integrates resources for environmental protection and anticipates changes in green technology and policies (Singh et al., 2022; Yousaf, 2021). It is critical for manufacturing enterprises in achieving sustainable and green development amid environmental changes (Qiu et al., 2020). This study contends that enhancing green dynamic capabilities is vital for manufacturing enterprises to improve their business model innovation. Therefore, we propose the following assumptions.

H3: Green dynamic capabilities has an effect on business model innovation in manufacturing enterprises.

In the existing literature, varying perspectives exist regarding the relationship between green innovation and green dynamic capabilities (Qiu et al., 2020). Several scholars have studied their direct relationship, offering different insights. Huang and Li (2017) illustrate that strong green dynamic capabilities positively influence green behavior, facilitating swift responses to competitors' actions and the development of innovative green products (Li & Lu, 2014). Lin and Chen (2017) emphasize the importance of robust green dynamic capabilities in the success of green product and process innovation within organizations, enabling firms to leverage existing knowledge to adapt to the dynamic business landscape (Lin & Chen, 2017).

Moreover, Qiu et al. (2020) highlights that firms with strong green dynamic capabilities tend to adopt sustainable solutions for customers, fostering an increase in green innovation. Given the transformation of manufacturing enterprises and the imperative for green development in a dynamic business environment, green dynamic capabilities play a crucial role in continuously evolving organizational capabilities essential for green innovation. Hence, based on these perspectives, we propose that:

H4: Green dynamic capabilities has an effect on green innovation in

manufacturing enterprises.

On one hand, business model innovation plays a significant role in enabling the implementation of green innovation by reorganizing resources and capabilities. Innovative business models allow companies to introduce new environmentally friendly resources and capabilities like clean energy and sustainable technologies, thereby driving green innovation. For instance, adopting circular economy models facilitates the transformation of waste into valuable resources, reducing environmental impact and optimizing resource use (Bocken et al., 2016). Rodrigues and Franco (2023) argue that amidst current uncertainties, enterprises recognize the necessity of embracing green innovation by adopting new business models.

On the other hand, many scholars view business model innovation as a catalyst for enterprise transformation and rejuvenation (Demil & Lecoq, 2010). It has been concluded that when enterprises prioritize green development during transformation, business model innovation can enhance their environmental capabilities, establishing sustainable competitive advantages (Mitchell & Coles, 2003). This study, considering business model innovation holistically, asserts that for enterprises aiming to achieve green innovation through green products, services, or technologies, integrating green innovation within the framework of business model innovation is imperative. Accordingly, we propose that:

H5: Business model innovation has an effect on green innovation in manufacturing enterprises.

To drive innovative or efficient business model innovation, organizations must harness both internal and external resources and capabilities. In today's knowledge economy, organizations are regarded as hubs of diverse knowledge, where integrating and utilizing knowledge underpins business model innovation. Knowledge sharing is acknowledged as pivotal in managing organizational knowledge resources, as emphasized by numerous researchers (Li, Huang, & Huang, 2022). Additionally, business model innovation amplifies a company's capacity to assimilate and apply external knowledge, including green knowledge shared through collaborations and partnerships (Kohtamäki et al., 2019).

Through knowledge sharing processes that incorporate green knowledge into business models, enterprises can leverage this knowledge to introduce new environmental technologies, modify business practices, uncover fresh market opportunities, and craft innovative business models aligning with sustainability principles. This strategic integration ultimately facilitates the development of new green products or services and streamlines production processes (Bieger et al., 2018). Therefore, we propose that:

H6: Business model innovation has a mediating effect on the impact of green knowledge sharing on green innovation in manufacturing enterprises.

Indeed, green dynamic capabilities are inherent and deeply ingrained within organizational management processes. Prior studies have demonstrated that dynamic capabilities, including green dynamic capabilities, foster an environment conducive to business model innovation (Zhang et al., 2018; Shi et al., 2019). Scholars have underscored the pivotal role of dynamic capabilities in facilitating business model innovation (Eisenhardt & Martin, 2000). Inigo et al. (2017) liken the business model to a bridge connecting corporate strategy to practical implementation, emphasizing how companies align their strategic objectives with various business activities (Casadesus-Masanell & Ricart, 2010), This study contends that if the specific objective pertains to green innovation, business model innovation can serve as an intermediary leveraging green dynamic capabilities to drive enterprises toward accomplishing their innovation goals. Hence, we propose that:

H7: Business model innovation has a mediating effect on the impact of green dynamic capabilities on green innovation in manufacturing enterprises.

This research concentrates on the relationship between green knowledge sharing, green dynamic capabilities and business model innovation in analyzing the factors affecting green innovation of Chinese manufacturing enterprises. It illustrates the mechanism of the relevant factors on this relationship using the theory of Natural basic view and business model innovation theory, which explores the mediating effect of business model innovation. Based on the literature review and hypothesis formulation, referenced to the previous study, a theoretical conceptual model of the factors influencing the green innovation of manufacturing enterprises including 4 latent and 9 observed variables can be constructed (see Figure 1), Moreover, we have designed a detailed research methodology framework to ensure that this study can conduct in a systematic manner.

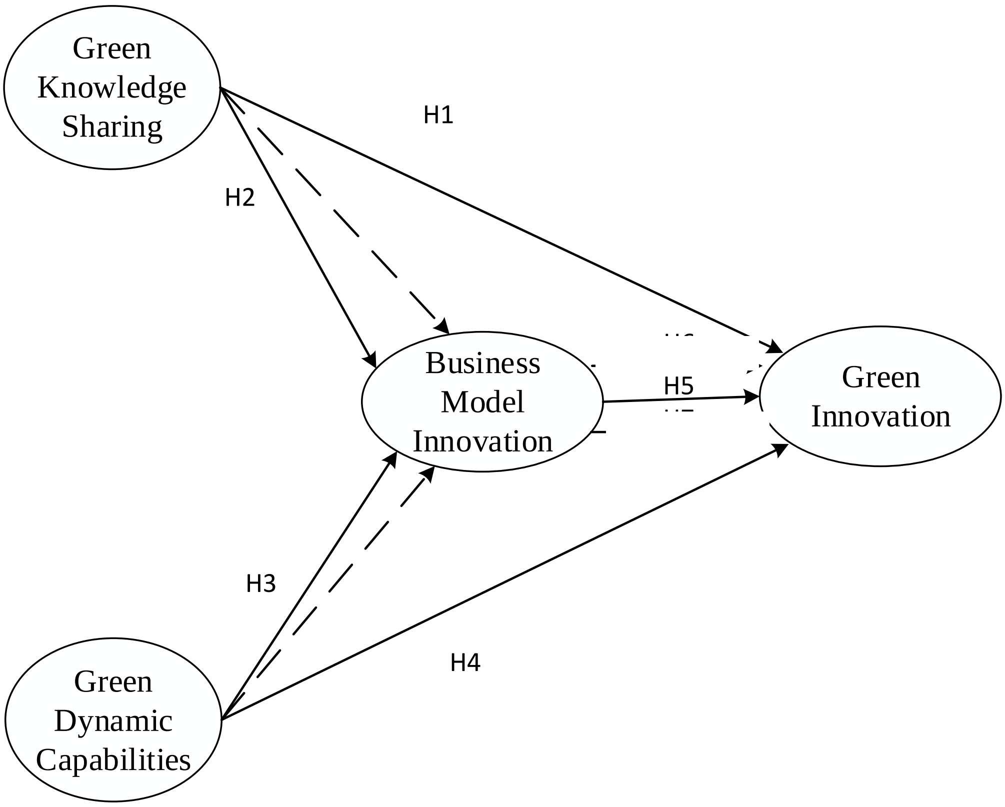

Figure 1 Conceptual Framework

Method

Participants

The research samples were mainly from Guangdong, Guangxi, Sichuan, Chongqing, Hubei, and Guizhou in China. The questionnaire survey adopts 3 methods: questionnaire star, e-mail, and on-site research, and the respondents are managers who are in the manufacturing industry enterprises. We investigated the characteristics of Chinese manufacturing enterprises and the current polluting degree or the future polluting trend through field visits to different manufacturing industry enterprises, and communicated and discussed with manufacturing industry managers and academics, at the same time, we finished a pre-survey questionnaire, after that revised the questionnaire many times to form the definitive version. The distributions of the sample by industry are reported in Table 1.

By distributing 482 questionnaires, we finally retrieved 471 and acquired 448 valid ones after eliminating the non-valid ones, and the validity rate is 92.2%. Among them, 225 (50.2%) were males, while 223 (49.8%) were females; the highest proportion was aged 31 to 40, at 50.0%, followed by 21 to 30 years old, at 39.9%;education level for the undergraduate and above accounted for 52%; in terms of occupational distribution, the majority of employees are working in state-owned enterprises and institutions(32.1%), followed by private sector employees (37.7%);In terms of Number of employees, enterprises were in the amount of 100 - 299 employees, accounting for 35.0%, followed by amount more than 300 employees ,accounting for about 19.6%. Finally, In terms of Enterprise establishment years, establishment 4-6 years accounting for 34.8%, establishment 7-10 years accounting for 31.6%, more than 10 year accounting for about 14.0%. Referring to data analysis result, indicating the reliability of the sample data collected in this study. Given the potential for common method bias with the consumer self-assessment survey items (Ba & Johansson, 2008; Podsakof et al., 2003), we examined the bias in homogeneity utilizing Harman's one-way test and validation factor tests (Vance et al., 2012), which yielded 11.88% of the variance explained by the 9 factors and the unrotated first factor, so there was no homophily in the research data.

Table 1 Sample Distribution by Industry

Industry	*f*	%
Beverage Manufacturing Industry/Textile and Leather Manufacturing Industry	33	7.4
Petroleum, Coal, and Chemical Raw Materials Manufacturing Industry	45	10.0
Wood and Furniture Manufacturing Industry	40	8.9
Machinery Equipment Manufacturing Industry	43	9.6
Metal Products Manufacturing Industry	45	10.0
Bio-pharmaceutical Industry	44	9.8
Computer, Communication, and Other Electronic Equipment Manufacturing Industry	41	9.2
Automobile and Parts Manufacturing Industry	35	7.8
Non-Metal Products Manufacturing Industry	39	8.7
New Energy and New Materials Enterprises	42	9.4
Other Industries	41	9.2
total	448	100

In summary, while the achieved sample size was slightly lower than the intended size, the study still maintained a strong participant base, allowing for statistically significant and precise findings. The initial sample size calculation, likely influenced by a power analysis, reflects the study's commitment to methodological rigor and ensuring the reliability of its conclusions.

Instruments

We place great emphasis on the design of our survey instruments. The survey instruments were meticulously adapted and translated, maintaining the integrity of the original scales. We employ a 5-point Likert scale to measure the 4 constructs: Green knowledge sharing was divided into 2 dimensions: green supplier sharing, green customer sharing, each dimension was measured by 5 items; Green dynamic capabilities were divided into 3 dimensions: green resource integration capability, green resource reconfiguration capability, environmental insight capability, which a total of 15 items used for measurement.

Green Innovation was divided into 2 dimensions green product, and green process innovation, each dimension was measured by 4 items; Business model innovation was divided into 2 dimensions: Noval business model innovation, and Efficient business model innovation, and measured by 11 items. Of these, green supplier sharing and green customer sharing draw on the study of Song et al. (2017); green resource reconfiguration capability, environmental insight capability refers to Qiu et al. (2020) and Dangelico et al. (2017); the measures for green product innovation, green process innovation follows those of Wong et al. (2012) and Chen et al. (2006); Noval business model innovation, and efficient business model innovation adapts from Song et al. (2017). Finally, we get a questionnaire with all the total 44 items (see Table 2), with scales 1, 2, 3, 4, and 5 for each, which means as follows: completely disagree, disagree, neither agree nor disagree, agree, and completely agree.

Data collection

This study adopts questionnaire survey method to widely contact and collect data, questionnaire survey method adopts 3 methods: questionnaire star, e-mail, and on-site research. Before the survey implementation, the questionnaire undergoes a small-scale pre- survey to ensure its effectiveness and appropriateness. At the same time, we also conducted internship investigation, expert consultation and other work, and modify the questionnaire content repeatedly to ensure the scientific research.

In this study, strict adherence to ethical guidelines was pivotal. A detailed process was established to ensure informed consent from all participants, involving a clear understanding of the study's objectives, voluntary participation acknowledgment, and assurances regarding the confidentiality and anonymity of responses. Ethical approval was likely obtained from an Institutional Review Board (IRB), underscoring the commitment to ethical standards and participant rights' protection. To safeguard sensitive data, the study implemented robust privacy and confidentiality measures, ensuring secure handling and storage. Additionally, acknowledging the potential impact on participants, the study likely provided necessary support resources. These comprehensive ethical procedures prioritized voluntary participation, ensured participant well-being, and underscored the study's methodological rigor, thereby enhancing the validity and reliability of its findings.

Data Analysis

This research employed the structural equation modeling method to investigate the direct effects between green knowledge sharing, green dynamic capabilities, business model innovation, and green innovation, with a particular emphasis on the mediating role of business model innovation. A series of advanced statistical techniques were employed to rigorously assess the hypothetical model. To accurately evaluate the analysis results, Smart PLS 4.0 software was utilized to perform data analysis through structural equation modeling (SEM). The purpose of the study is to systematically examine the impact of green knowledge sharing, green dynamic capabilities, and business model innovation on green innovation, as well as how business model innovation acts as a mediating variable. This study adopted a quantitative research method (Bloomfield & Fisher, 2019) and integrated the research variables into the hypothetical model for investigation.

Table 2 Constructs and their Loadings

Constructs		Measurement content	λ
Business model innovation (α = 0.779; AVE = 0.819; CR = 0.900)	Efficiency business model innovation (α = 0.656; AVE = 0.54; CR = 0.920)	1. The value propositions offered through our products/services now are different from offered two years ago	0.811
		2. We made new arrangements for information exchange throughout the supply chain in the past two years.	0.809
		3. We regularly consider innovative opportunities for changing our existing pricing models	0.815
		4. Our production costs are constantly examined and if necessary improved in relation to market prices.	0.804
		5. We emphasize innovative/modern actions to increase customer retention (e.g., CRM)	0.826
		6. We always look forward to improving the flow of materials, products, services, information, and money throughout the supply chain	0.795
Green knowledge sharing (α = 0.781; AVE = 0.820; CR = 0.901)	Green supplier sharing (α = 0.899; AVE = 0.714; CR = 0.926)	1.The company has frequent exchanges of expertise in green product design with key suppliers	0.846
		2. The company has frequent exchanges of expertise in green processes design with key suppliers	0.812
		3. The company has frequent exchanges of expertise in green procurement with key suppliers	0.873
		4. The company has frequent exchanges with key suppliers on green knowledge related to green demand changes and customer preference changes	0.874
		5. The company has frequent exchanges with key suppliers on green knowledge related to green market demand trends and forecasts	0.817
	Green customer sharing (α = 0.889; AVE = 0.694; CR = 0.919)	1. The company has frequent knowledge exchanges with key customers in the feedback of green product innovations	0.870
		2. The company has frequent exchanges with key customers on green knowledge related to green market demand trends and forecasts	0.814
		3. The company has frequent knowledge exchanges with key customers on green marketing expertise	0.810
		4. The company has frequent knowledge exchanges with key customers on green distribution expertise	0.816
		5.The company has frequent exchanges with	0.852

		key customers on green knowledge related to green packaging design or technology	
Green dynamic capabilities (α = 0.848; AVE = 0.767; CR = 0.908)	Green resource integration capability (α = 0.884; AVE = 0.684; CR = 0.915)	1.There is collaboration between the company's environmental protection department and the product design, manufacturing, and marketing departments	0.856
		2.The enterprise will consider the requirements of customers for the environmental performance of the product.	0.830
		3.The enterprise will incorporate the knowledge and competence of suppliers into the environmental effect of raw materials and parts	0.812
		4.The enterprise will incorporate the knowledge and competence of suppliers into the environmental effect of the production process	0.824
		5.The enterprise will collaborate with wholesalers, retailers, and other channel members to minimize environmental hazards of products	0.811
	Green resource reconfiguration capability (α = 0.903; AVE = 0.674; CR = 0.925)	1.The enterprise will recruit environmental experts in the field of product life cycle assessment and environmental design	0.880
		2.The enterprise will train product development team members or developers by attending conferences, holding symposiums, or using other ways to enhance employees' environmental knowledge and competence	0.805
		3.The enterprise will step up research and development in terms of product environmental protection (such as increasing investment	0.822
		4.The enterprise will engage in restructuring by creating new divisions, realigning product lines, or adopting other ways to concentrate on environmental sustainability	0.791
		5.The enterprise will realign its relationships with suppliers by conducting environmental audits of suppliers or changing suppliers to mitigate the environmental pollution caused by its products	0.833
		6.The enterprise will realign its relationships with customers to alleviate the environmental effect of its products	0.789
	Environmental insight capability (α = 0.843; AVE = 0.679; CR = 0.894)	1.The enterprise can timely understand and master the support policies related to green development	0.828
		2.The enterprise can timely keep abreast of and respond to industry green technology changes in the industry	0.805
		3.The enterprise can timely understand and master the development trend of the industry in time	0.833
		4.The enterprise can timely keep abreast of customers' green needs to adapt to market changes	0.832
Green innovation (α = 0.774; AVE	Green product innovation (α = 0.856; AVE = 0.698;	1.Our enterprise chooses the materials of the product that produce the least amount of pollution for conducting the product development or design	0.868

= 0.816; CR = 0.899)	CR = 0.903)	2.Our enterprise chooses the materials of the product that consume the least amount of energy and resources in conducting the product development or design	0.827
		3.Our enterprise uses the fewest amounts of materials to comprise the product in conducting the product development or design	0.828
		4.Our enterprise circumspectly deliberates whether the product is easy to recycle, reuse, and decompose in conducting the product development or design	0.819
	Green process innovation (α = 0.890; AVE = 0.753; CR = 0.924)	1.Our enterprise's manufacturing process effectively reduces the discharge of hazardous substances or waste	0.836
		2.Our enterprise's manufacturing process recycles waste and emissions that enable them to be disposed of and reused.	0.866
		3.Our enterprise's manufacturing process reduces the consumption of water and energy	0.871
		4.Our enterprise's manufacturing process reduces the use of raw materials	0.897

The preliminary phase of the study included analyzing the validity of each variable scale to ensure the reliability of the scales and the rationality of item design. Subsequently, the fit of the structural equation model was assessed, and an overall structural equation model diagram was constructed based on this. Then, we analyzed the direct impact of green knowledge sharing, green dynamic capabilities, business model innovation on green innovation. Ultimately, the study focused on exploring the mediating effect of business model innovation on green knowledge sharing and green innovation, as well as between green dynamic capabilities on green innovation. The findings are expected to contribute significantly to the existing body of knowledge in this field and offer valuable insights for future research and practical applications.

Results

This research employed the structural equation modeling method to investigate the direct effects between green knowledge sharing, green dynamic capabilities, business model innovation, and green innovation, with a particular emphasis on the mediating role of business model innovation. This research was used SPSS and Smart PLS, specific, following data collection, rigorous assessments were conducted encompassing scale reliability, validity analysis, and structural equation model evaluation. This included scrutinizing model fit (R^2), predicted correlation index (Q^2), collinearity diagnosis (VIF), significance of path sizes, and effect values (Effect size) to analyze both direct and indirect effects of the variables. Through this process, hypotheses were verified, leading to conclusive findings and recommendations.

Scale Reliability And Validity Tests

The results of the reliability test for each latent variable using SPSS are shown in Table 2, and Cronbach's a for each latent variable was above 0.7. Further testing of the reliability of the overall scale yielded a Cronbach's a of 0.902, indicating that the questionnaire data had good reliability

Table 2 *Reliability and Validity Test Results*

Constructs		Measurement content	λ
Business model innovation (α = 0.779; AVE = 0.819; CR = 0.900)	Novel business model innovation (α= 0.906; AVE = 0.729; CR = 0.931)	1.We offer a new combination of products and services through our business model	0.894
		2.We have expanded our products and services to new markets	0.821
		3.The business model brings new suppliers and channel partners	0.901
		4.We often introduce new operational processes, routines, and norms into our business model	0.832
		5.We frequently review our business model and introduce innovative ideas and innovations to meet the current market demand	0.817

The sample data were subjected to KMO and Bartlett's test to determine whether they could be used for factor analysis. A validity analysis of each variable was assessed. and this research of the results of KMO and Bartlett's test showed that the KMO was 0.751 and Bartlett's spherical test $p < .001$, which combined the 2 indicators to demonstrate that this questionnaire data is suitable for exploratory factor analysis.

The convergent validity and composite reliability of the sample data after test were showed in Table 2, where the factor loadings are all above 0.7, AVE are all above 0.5, and CR are all above 0.8, which reflects the good validity of the questionnaire (Mohammed Amin Almaiah & Al Mulhem, 2019). In this study, the more rigorous AVE method was used to evaluate the differential validity. Further, the discriminant validity test was used to identify whether there was discrimination among the constructs. We do the test; the test results are shown in Table 3. The coefficient of correlation value is below 0.85, which indicates that there is a good discriminatory validity between each variable. The modelling fitness analysis using Smart PLS software reveals that the SRMR was 0.054(value< .08). Preliminary judgment, that is, the overall fit of the research model is good and suitable for further hypothesis testing analysis.

Table 3 *Discrimination Validity Test Results*

Variable	1	2	3	4
1. BMI	**0.905**			
2. GKS	0.530	**0.906**		
3. GDC	0.623	0.251	**0.876**	
4. GI	0.675	0.539	0.565	**0.903**

Note. The diagonal (bold) numbers are the square root of the AVE value.
BMI = Business Model Innovation; GKS = Green Knowledge Sharing; GDC =

Green Dynamic Capabilities; GI = Green Innovation.

Model Fitting Test

In this study, Smart PLS was used to analyze the model, therefore the following indicators were mainly considered when evaluating the model:(1)The R-squared values: the result of the R-squared values of BMI, GKS,GDC and GI ranged from 0.33 to 0.67, indicating a moderate interpretation.(2)Collinearity diagnosis VIF: The diagnostic analysis of the collinearity of the model shows that the VIF between measured variables is lower than 5, and the VIF between latent variables is also lower than 5, indicating that there is no collinearity in the model.(3)Predictive correlation index Q2:It represents the correlation of exogenous interpretation of endogenous variables, generally between 0-1, Q2 is greater than 0, and the model has predictive ability. When Q2 is less than 0, there is no prediction, between 0.02-0.13 is small, 0.13-0.26 is general, and greater than 0.26 is strong. Through calculating，The Q^2 value of business model innovation was 0.437 and green innovation was 0.439, which were greater than 0.26. This shows that the predictive ability of each explained variable of the research model Q2 is strong. According to the above three points, the model constructed in this study can be accepted, the evaluation is good. Finally, the model has a good fit, and the constructed model is suitable for further hypothesis testing.

Direct Effect Analysis

With the help of Smart PLS, the correlation coefficients between variables can be directly output. we use Bootstrapping method to calculating the path coefficients, the results showed in Table 4.it show the results of each direct effect in the model. It can be intuitively seen that the non-standardized coefficients, standardized coefficients, significance, and other related information of each path in the study model assumptions are provided, the model showed in Figure 2

Table 4 *Path Coefficients for PLS Structural Equation Modelling Results*

	Original sample (O)	*SD*	*t*	*p*
BMI → GI	0.357	0.047	7.655	0.000
GKS→ BMI	0.399	0.033	12.040	0.000
GKS → GI	0.282	0.038	7.469	0.000
GDC → BMI	0.523	0.030	17.168	0.000
GDC → GI	0.272	0.042	6.523	0.000

From the above Table 4, we can see that the business model innovation → green innovation has a significant positive impact ($\beta = 0.357$, $p < .001$), so, hypotheses H5 was supported. Green Knowledge sharing → Business model innovation has a significant positive impact ($\beta = 0.399$, $p < .001$), hence, hypotheses H2 was supported. Green knowledge sharing → Green innovation has a significant positive impact ($\beta = 0.282$, $p < .001$), therefore, hypotheses H1 was supported. Green Dynamic Capabilities → Business model innovation has a significant positive impact ($\beta = 0.523$, $p < .001$), and hypotheses H3 was supported. Green Dynamic Capabilities→ Green innovation has a significant positive impact ($\beta = 0.272$, $p < .001$), The assumptions H4 was support. Currently, the H1-H5 hypotheses proposed in this study hold.

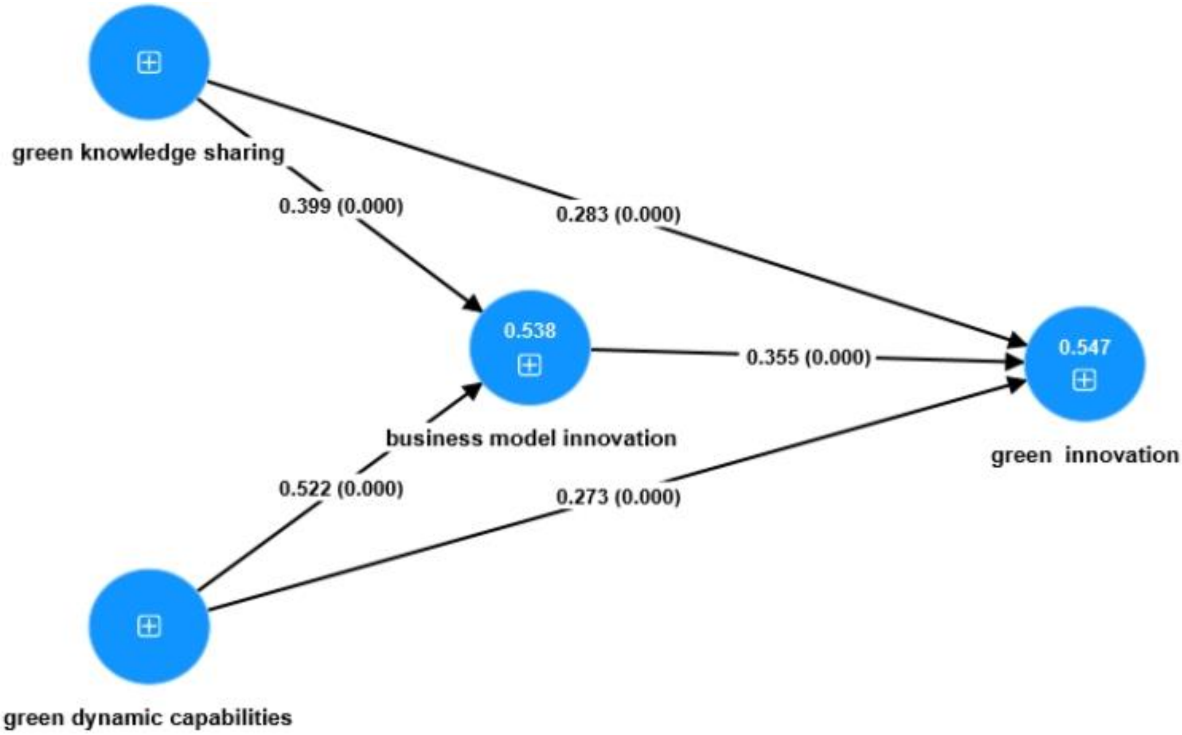

Figure 2 *Measurement Model Result*

Mediating effect analysis

In order to determine whether the innovation of business model innovation (BMI) played a mediation role in the influence of the independent variable green knowledge sharing (GKS) and green dynamic capabilities (GDC) on green innovation (GI), the Bootstrap mediation effect test was used to assess whether the mediation effect was significant, the confidence interval was Bias Corrected (95%), and the repeated sampling was 5000 times. The result showed in Table 5.

Table 5 Bootstrap Mediation effect test result

Path	Original sample (O)	Sample mean (M)	*t*	*p*	Bias Corrected（95%） 2.50%	97.50%
GKS → GI	0.282	0.038	7.469	0.000	0.207	0.355
GKS → BMI → GI	0.142	0.022	6.363	0.000	0.101	0.188
GKS→GI (total effect)	0.424	0.033	12.745	0.000	0.355	0.486
GDC →GI	0.272	0.042	6.523	0.000	0.192	0.356
GDC →BMI → GI	0.186	0.027	6.929	0.000	0.136	0.241
GDC → GI (total effect)	0.459	0.033	13.817	0.000	0.393	0.523

Based on the Table 5, we can find that the indirect effect of green knowledge sharing and green innovation was 0.142, 95% confidence interval [0.101,0.188], excluding 0, which indicated that the mediation effect is significant, accounting for 33.5%. Therefore H6 was supported.

In the same way，based on the above Table 5, we can find that the indirect effect *mediating* path of green dynamic capabilities and green innovation was 0.186, $p < .000$, 95% confidence interval [0.101,0.188], excluding 0, which indicated that the mediation effect is significant, accounting for 40.6%.therefor H7 was supported.

Discussion

This study employed structural equation modeling to explore the relationships between green knowledge sharing, green dynamic capabilities, business model innovation, and green innovation. The findings revealed noteworthy insights: green knowledge sharing had a standardized path coefficient of 0.282 on green innovation and 0.399 on business model innovation. Similarly, green dynamic capabilities showed coefficients of 0.272 on green innovation and 0.523 on business model innovation. Moreover, the coefficient of business model innovation on green innovation was 0.357. All these path coefficients were statistically significant at $p < .01$, affirming the H1 to H5 hypotheses. These results align with prior research; for instance, Huang et al. (2019) underscored the pivotal role of collaborative platforms and knowledge sharing communities in accelerating the adoption of green technologies. Singh et al. (2022) suggested that leveraging green dynamic capabilities helps firms integrate environmental concerns into their strategies, fostering competitiveness. Furthermore, Inigo et al. (2017) likened business models to bridges connecting corporate strategy and operational activities, a concept echoed by Casadesus-Masanell & Ricart (2021).

This study's findings using structural equation modeling demonstrated significant relationships among green knowledge sharing, green dynamic capabilities, business model innovation, and green innovation. Notably, green knowledge sharing and dynamic capabilities exhibited substantial impacts on both green and business model innovation. The paths revealed standardized coefficients of 0.282 and 0.399 from green knowledge sharing to green and business model innovation, respectively, while green dynamic capabilities demonstrated coefficients of 0.272 and 0.523 on green and business model innovation. Additionally, business model innovation had a significant influence on green innovation, with a coefficient of 0.357. These findings strongly support the hypotheses posited in this study, in line with existing literature. Huang et al. (2019) highlighted the role of collaborative platforms in expediting the adoption of green technologies, while Singh et al. (2022) emphasized the utilization of green dynamic capabilities to integrate environmental concerns into firms' strategies for sustained competitiveness. Furthermore, Inigo et al. (2017) and Casadesus-Masanell & Ricart (2021) underscored the crucial role of business models in aligning corporate strategy with operational activities, acting as vital connectors between the two realms.

Based on the above analysis, the research assessed the seven proposed hypotheses and obtained confirmations. The research findings indicate that green knowledge sharing, green dynamic capabilities, business model innovation, have significant impacts on the green innovation. Furthermore, business model innovation not only plays a mediating role between green knowledge sharing and green innovation but also exhibits the same function between green dynamic capabilities and green innovation.

Moreover, the finding that Business model innovation is one of the factors influencing green innovation further enriches the theoretical basis of green innovation. The linkage between green knowledge sharing, green dynamic capabilities, and their impact on green innovation through business model innovation is another topic worthy of consideration for businesses and business managers. In the context of the nation achieving dual-carbon objectives, how enterprises undertake green transformation and upgrades demands contemplation regarding these guiding mechanisms for green innovation. Business managers should intensify practical efforts, focus on green innovation, and actively contemplate and explore various aspects such as enterprise resources, knowledge, and business models. They should tirelessly seek new paths and foster novel approaches, making initiative-taking contributions to the sustainable development of their enterprises and the realization of the nation's dual-carbon goals.

Suggestions

Theoretical Implications

This paper considers business model innovation in the context of environment issue green development, building a conceptual model of the factors driving green innovation in manufacturing enterprises based on the theory of Natural basic view and business model innovation theory while testing model hypotheses with the help of research to obtain the following recommendation

First, the business model innovation has a notable positive correlation with the green innovation in manufacturing enterprises. When the national government implements dual-carbon goals and encourages green development, under the pressure exerted by the government, business managers pay more attention to business model innovation. They tend to integrate green concepts into business activities and value creation, initiating green practices. This enhances the likelihood of companies achieving green innovation goals, completing green transformation and upgrades to confront various challenges and difficulties. Therefore, cultivating an actively constructing novel or efficient business model innovations becomes increasingly crucial for achieving sustainable development and the nation's dual-carbon objectives.

Furthermore, concerning green innovation, there exists a positive correlation between green knowledge sharing and innovation, consistent with findings from other scholars. However, in China, the manufacturing industry serves as the economic backbone, propelling economic development but also resulting in environmental issues. This urgency necessitates manufacturing enterprises to expedite their green transformation. Green knowledge sharing serves as a means to promote knowledge and technology exchange among manufacturing enterprises, thereby driving the development of green products and provision of green services. Hence, businesses and business managers must prioritize green knowledge sharing to ultimately achieve green innovation and sustainable development.

Third, green dynamic capabilities demonstrate a positive correlation with green innovation, verified in the manufacturing industry, aligning with research in the business domain. Hence, manufacturing enterprise managers should prioritize cultivating the green dynamic capability of their businesses. As mentioned by Qiu et al., green dynamic capability is crucial for manufacturing enterprises in the stage of green development. This high-level capability enables companies to achieve sustainable and green development amid environmental changes (Qiu et al., 2020).

Fourth, a positive correlation exists between green dynamic capability and business model innovation. This implies that business managers need to strengthen the cultivation of green dynamic capabilities as it, to a certain extent, fosters innovation in enterprise business models, thereby creating value for the company. Simultaneously, there is a positive correlation between green knowledge sharing and business model innovation. Hence, when focusing on green knowledge sharing, business managers need to delve deeper into its critical relationship with business model innovation and strive for mutual reinforcement as much as possible.

Fifth, against the backdrop of the national government promoting dual-carbon objectives and encouraging green development, business model innovation can function as an intermediary influencing green innovation alongside green knowledge sharing and green dynamic capability. This intermediary role offers new paths and approaches for enterprises to pursue green innovation. Business managers should highly regard and utilize these novel avenues and ideas, exerting further efforts towards the transformation and green development of their enterprises.

Limitations and Future Research

This study investigates the effects of green business model innovation and green innovation on manufacturing enterprises in China. However, the study has some limitations. Firstly, it only focuses on the green innovation of heavy pollution manufacturing enterprises in the region, which could limit the generalizability of the research conclusions. Secondly, the uniformity of the sampled enterprises in terms of attributes and regional distribution is not well-controlled, which could affect the reliability and validity of the empirical results. To improve the applicability of the research findings, future studies can expand the scope of research to include different industries and regions, and pay more attention to controlling the structure of the sampled enterprises to reduce sample bias.

References

Achi, A., Adeola, O., & Achi, F. C. (2022). CSR and green process innovation as antecedents of micro, small, and medium enterprise performance: Moderating role of perceived environmental volatility. Journal of Business Research, 139, 771–781. https://doi.org/10.1016/j.jbusres.2021.10.016

Aguilera-Caracuel, J., & Ortiz-de-Mandojana, N. (2013). Green innovation and financial performance: An institutional approach. Organization & Environment, 26(4), 365–385.https://doi.org/10.1177/108602661350793

Albort-Morant, G., Leal-Rodríguez, A. L., & De Marchi, V. (2018). Absorptive capacity and relationship learning mechanisms as complementary drivers of green innovation performance. Journal of Knowledge Management. https://doi.org/10.1108/JKM-07-2017-0310

Almaiah, M. A., & Al Mulhem, A. (2019). Analysis of the essential factors affecting the intention to use of mobile learning applications: A comparison between universities adopters and non-adopters. Education and Information Technologies, 24(2), 1433–1468. https://doi.org/10.1007/s10639-018-9840-1

Amit, R., & Zott, C. (2001). Value creation in e-business. Strategic Management Journal, 22(6–7), 493–520. https://doi.org/10.1002/smj.187

Ar, I. M. (2012). The Impact of Green Product Innovation on Firm Performance and Competitive Capability: The Moderating Role of Managerial Environmental Concern. Procedia - Social and Behavioral Sciences, 62, 854–864. https://doi.org/10.1016/j.sbspro.2012.09.144

Awan FH, Dunnan L, Jamil K, Mustafa S, Atif M, Gul RF, Guangyu Q (2022) Mediating role of green supply chain management between lean manufacturing practices and sustainable performance. Front Psychol 12(January):1–11. https://doi.org/10.3389/fpsyg.2021.810504

Awan, U., Arnold, M. G., & Gölgeci, I. (2021). Enhancing green product and process innovation: Towards an integrative framework of knowledge acquisition and environmental investment. Business Strategy and the Environment, 30(2), 1283–1295.

Bataineh, M. J., Sánchez-Sellero, P., & Ayad, F. (2023). Green is the new black: How research and development and green innovation provide businesses with a competitive edge. Business Strategy and the Environment. https://doi.org/10.3390/su141062023.

Cha W, Abebe M, Dadanlar H (2019) The effect of CEO civic engagement on corporate social and environmental performance. Social Responsibility Journal 15(8):1054–1070. https://doi.org/10.1108/SRJ-05-2018-0122

Chen, Y.-S. (2008). The driver of green innovation and green image–green core competence. Journal of Business Ethics, 81, 531–543. https://doi.org/10.1007/s10551-007-9522-1

Chen, Y.-S., & Chang, K.-C. (2013). The nonlinear effect of green innovation on the corporate competitive advantage. Quality & Quantity, 47, 271–286. https://doi.org/10.1007/s11135-011-9518-x

Chen, Y.-S., Lai, S.-B., & Wen, C.-T. (2006). The Influence of Green Innovation Performance on Corporate Advantage in Taiwan. Journal of Business Ethics, 67(4), 331–339. https://doi.org/10.1007/s10551-006-9025-5

Chen, Y.-S., Lin, Y.-H., Lin, C.-Y., & Chang, C.-W. (2015). Enhancing green absorptive capacity, green dynamic capacities and green service innovation to improve firm performance: An analysis of structural equation modeling (SEM). Sustainability, 7(11), 15674–15692. https://doi.org/10.3390/su71115674

Cheng, C. C. J. (2020). Sustainability Orientation, Green Supplier Involvement, and Green Innovation Performance: Evidence from Diversifying Green Entrants. Journal of Business Ethics, 161(2), 393–414. https://doi.org/10.1007/s10551-018-3946-7

Chih-Pei, H., & Chang, Y.-Y. (2017). John W. Creswell, research design: Qualitative, quantitative, and mixed methods approach. Journal of Social and Administrative Sciences, 4(2), 205–207.

Hameed Z, Naeem RM, Hassan M, Naeem M, Nazim M, Maqbool A (2021) How GHRM is related to green creativity? A moderated mediation model of green transformational leadership and green perceived organizational support. International Journal of Manpower, ahead-of-p(ahead-of-print). https://doi.org/10.1108/IJM-05-2020-0244

Lanlika, M., Bergmen, J., Jantunen, A., & Saksa, J. (2005). Knowledge Sharing in the Open Innovation Process-Case: Grid Computing. In Proc. 6th European Conference on Organizational Knowledge, Learning and Capabilities. https://doi.org/10.1005/bse.2006

Li, D., Zhao, Y., Zhang, L., Chen, X., & Cao, C. (2018). Impact of quality management on green innovation. Journal of Cleaner Production, 170, 462–470. https://doi.org/10.1016/j.jclepro.2017.09.158

Li, H. (2022). Green Innovation, Green Dynamic Capability, and Enterprise Performance: Evidence from Heavy Polluting Manufacturing Enterprises in China. Complexity, 2022, 1–13. https://doi.org/10.1155/2022/7755964

Li, W., Bhutto, M. Y., Waris, I., & Hu, T. (2023). The Nexus between Environmental Corporate Social Responsibility, Green Intellectual Capital and Green Innovation towards Business Sustainability: An Empirical Analysis of Chinese Automobile Manufacturing Firms. International Journal of Environmental Research and Public Health, 20(3), 1851. https://doi.org/10.3390/ijerph20031851

Li, X., Qiang, Q., Huang, L., & Huang, C. (2022). How knowledge sharing affects business model innovation: an empirical study from the perspective of ambidextrous organizational learning. Sustainability, 14(10), 6157.https://doi.org/10.3390/su14106157.

Lin, Y.-H., & Chen, Y.-S. (2017). Determinants of green competitive advantage: The roles of green knowledge sharing, green dynamic capabilities, and green service innovation.

Quality & Quantity, 51(4), 1663–1685. https://doi.org/10.1007/s11135-016-0358-6
Ma, L., Ali, A., Shahzad, M., & Khan, A. (2022). Factors of green innovation: The role of dynamic capabilities and knowledge sharing through green creativity. Kybernetics. https://doi.org/10.1108/K-06-2022-0911
Madhavan, M., Sharafuddin, M. A., & Chaichana, T. (2022b). Impact of Business Model Innovation on Sustainable Performance of Processed Marine Food Product SMEs in Thailand—A PLS-SEM Approach. Sustainability, 14(15), 9673. https://doi.org/10.3390/su14159673
NAA Seman, K Govindan, A Mardani, & N Zakuan. (2019). The mediating effect of green innovation on the relationship between green supply chain management and environmental performance. Journal of Cleaner Production, 30(8), 115–127. https://doi.org/doi.org/10.1016
Nureen, N., Liu, D., Irfan, M., & Işik, C. (2023). Nexus between corporate social responsibility and firm performance: A green innovation and environmental sustainability paradigm. Environmental Science and Pollution Research. https://doi.org/10.1007/s11356-023-26675-1
Pathak, V., Jena, B., & Kalra, S. (2013). Qualitative research. Perspectives in Clinical Research, 4(3). https://doi.org/10.4103/2229-3485.115389.
Qiu, L., Jie, X., Wang, Y., & Zhao, M. (2020). Green product innovation, green dynamic capability, and competitive advantage: Evidence from Chinese manufacturing enterprises. Corporate Social Responsibility and Environmental Management, 27(1), 146–165. https://doi.org/10.1002/csr.1780
Rodrigues, M., & Franco, M. (2023). Green Innovation in Small and Medium-Sized Enterprises (SMEs): A Qualitative Approach. Sustainability, 15(5), 4510. https://doi.org/10.3390/su15054510
Rudawska, A. (2020). Knowledge sharing and creativity: individual and organizational perspective. In Contemporary Challenges in Cooperation and Coopetition in the Age of Industry 4.0: 10th Conference on Management of Organizations' Development (MOD) (pp. 107-121). Springer International Publishing.https://doi.org/10.1007/978-3-030-30549-9_5
Sánchez-García, E., Martínez-Falcó, J., Alcon-Vila, A., & Marco-Lajara, B. (2023). Developing Green Innovations in the Wine Industry: An Applied Analysis. Foods, 12(6), 1157. https://doi.org/10.3390/foods12061157
Shahzad, M., Qu, Y., Javed, S. A., Zafar, A. U., & Rehman, S. U. (2020). Relation of environment sustainability to CSR and green innovation: A case of Pakistani manufacturing industry. Journal of Cleaner Production, 253, 119938. https://doi.org/10.1016/j.jclepro.2019.119938
Singh, S. K., Del Giudice, M., Chiappetta Jabbour, C. J., Latan, H., & Sohal, A. S. (2022). Stakeholder pressure, green innovation, and performance in small and medium-sized enterprises: The role of green dynamic capabilities. Business Strategy and the Environment, 31(1), 500-514.https://doi.org/10.1002/bse.2906.
Tang, M., Walsh, G., Lerner, D., Fitza, M. A., & Li, Q. (2018). Green Innovation, Managerial Concern and Firm Performance: An Empirical Study. Business Strategy and the Environment, 27(1), 39–51. https://doi.org/10.1002/bse.1981
Teece, D. J. (2007). Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. Strategic Management Journal, 28(13), 1319–1350. https://doi.org/10.1002/smj.640
Teece, D. J. (2018). Business models and dynamic capabilities. Long Range Planning, 51(1),

40–49. https://doi.org/10.1016/j.lrp.2017.06.007

Yousaf, Z. (2021). Go for green: green innovation through green dynamic capabilities: accessing the mediating role of green practices and green value co-creation. Environmental science and pollution research, 28(39), 54863-54875.https://doi.org/10.1108/MD-09-2020-0314.

Yuan, B., & Cao, X. (2022). Do corporate social responsibility practices contribute to green innovation? The mediating role of green dynamic capability. Technology in Society, 68, 101868. https://doi.org/10.1016/j.techsoc.2022.101868

Zhang, X., Meng, Q., & Le, Y. (2022a). How Do New Ventures Implementing Green Innovation Strategy Achieve Performance Growth? Sustainability, 14(4), 2299. https://doi.org/10.3390/su14042299

Zhang, X., Meng, Q., & Le, Y. (2022b). How Do New Ventures Implementing Green Innovation Strategy Achieve Performance Growth? Sustainability, 14(4), 2299. https://doi.org/10.3390/su14042299

Zulfikarijah, F., Khwarazmita, T., Masudin, I., Jihadi, M., Jatmiko, R. D., & Malik, N. (2023). The role of GSCM and GHRM practices on green innovation in Indonesian real estate environmental performance. International Journal of Agile Systems and Management, 16(1), 44-81. https://doi.org/10.3290/sh141061565.

Zulfiqar, S., & Khan, M. S. (2021). Organizational identification and knowledge sharing behavior: Mediating role of organizational citizenship behavior and moderating role of collectivism and leader-member exchange. Knowledge and Process Management, 28(4), 388-398. https://doi.org/10.1002/kpm.169