The influence mechanism of digital technology empowering green innovation of textile firms: a knowledge search perspective

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ABSTRACT – REZUMAT

The influence mechanism of digital technology empowering green innovation of textile firms: a knowledge search perspective

Digital technology is a vital engine for the green innovation of textile firms. In recent years, knowledge search through digital platforms has allowed for obtaining richer knowledge information. Using a data engine for data mining can improve the efficiency of firm knowledge retrieval. Considering these factors, this paper collects data from 226 textile firms and uses multiple regression analysis methods to analyse the impact mechanism and path of digital technology empowering textile firms' green innovation. The study found that digital technology has a positive impact on the green innovation of textile firms through the mediating role of knowledge search. Environmental dynamism positively moderates the relationship between digital technology and green innovation of textile firms. Based on this, the management enlightenment of textile firms using digital technology to realize knowledge search and promote green innovation is put forward.

***Keywords**: digital technology, textile firms, green innovation, knowledge search*

Mecanismul de influență al tehnologiei digitale ce susţine inovația ecologică a firmelor textile: o perspectivă de căutare a informaţiilor

Tehnologia digitală este un motor vital pentru inovația ecologică a firmelor textile. În ultimii ani, căutarea informaţiilor prin intermediul platformelor digitale a permis obținerea de informații mai vaste. Utilizarea unui motor de căutare pentru extragerea datelor poate îmbunătăți eficiența colectării informaţiilor companiei. Luând în considerare factorii menţionaţi, acest studiu colectează date de la 226 de firme textile și utilizează metode de analiză de regresie multiplă pentru a investiga mecanismul de impact și traseul tehnologiei digitale, care sporesc inovația ecologică a firmelor textile. Studiul a constatat că tehnologia digitală are un impact pozitiv asupra inovației ecologice a firmelor textile prin rolul de mediere al căutării informaţiilor. Dinamismul mediului moderează pozitiv relația dintre tehnologia digitală și inovația ecologică a firmelor textile. Pe baza acestui fapt, se propune informarea managerială a firmelor textile utilizând tehnologia digitală, pentru a realiza căutarea de informaţii și a promova inovația ecologică.

***Cuvinte-cheie**: tehnologie digitală, firme textile, inovație ecologică, căutarea informaţiilor*

INTRODUCTION

"Green textile" is a prominent theme in the development of the textile industry. Digital technology enables the high-end, intelligent, and green development of textile firms. Printing and dyeing equipment, for example, uses digital technology to drive new energy-saving and environmental protection technologies and promote textile firms to develop in a green direction supported by digital platforms [1, 2]. Digital technology improves the manner of information dissemination and processing with its characteristics of embeddedness and integration. These traits promote resource-sharing and integration and profoundly affect the information interaction mode and cooperation relationship among firms. Digital technology helps firms search for diversified and novel knowledge and helps firms obtain complementary resources needed for green innovation [3].

"Knowledge search" includes knowledge identification, search acquisition, integration, and utilization. Firms use digital technology to collect, organize and analyse data, thereby promoting product research, green production and marketing [4].

Textile firms are facing environmental dynamics in the process of green innovation. Market demand, technological development, and the information environment are encountering dynamic development, which leads to behavioural changes or modified needs of stakeholders, such as competitors, customers, partners, and governments. Albert et al. [5] analysed 112 firms from the Spanish auto parts manufacturing industry based on the structural equation of variance, pointing out that green innovation strategies such as environmental management and green practice can help firms gain competitive advantages. According to dynamic capability theory, a positive relationship can be seen between institutional pressure and eco-innovation [6]. When the market trend frequently changes, the ability of textile firms to collect

relevant information directly affects their understanding of raw material fluctuations and changes in consumer demand, which in turn affects their green innovation. Digital technology helps firms conduct data collection, knowledge acquisition, and information-sharing ahead of dynamic market changes.

In summary, this paper focuses on clarifying the following three research questions. First, we try to verify whether digital technology can become a powerful starting point for textile firms to achieve green innovation. Second, we explore the intermediate transmission mechanism of digital technology affecting the green innovation of textile firms, that is, explore whether textile firms can use digital technology to complete knowledge searches and achieve green innovation. Thirdly, in the context of environmental dynamics, this paper discusses the situational mechanism of digital technology affecting the green innovation of textile firms. To solve the above problems, based on the new development model of digital intelligence governance, we clarify the influence mechanisms and action paths of textile firms to use digital technology to obtain knowledge and improve the level of green innovation. Moreover, we reveal the moderating effect of environmental dynamics in the process of how digital technology affects knowledge search and green innovation in textile firms.

LITERATURE REVIEW

With the deepening of research on firm innovation, green innovation can be divided into two categories: incremental and radical green innovation.

"Incremental" green innovation is the improvement of existing products and technologies, or the transformation of technology platforms and products to improve the design of existing products [5–6]. This innovation expands current knowledge and skills, grows and enriches existing product lines, and improves the efficiency of existing distribution channels to meet the needs of consumers or markets [7].

In contrast, "radical" green innovation explains the connotation and extension of Schumpeter's "radical innovation," fundamentally realizing a breakthrough in existing technology [8]. Relying on a new technology platform, firms develop new products or services to subvert the competitive environment to tap into potential consumers or markets [7]. Radical green innovation seeks new possibilities, emphasizes the acquisition and creation of new knowledge, and engages in more innovation. For example, the textile printing and dyeing sector is a typically pollution-intensive industry. Textile firms form efficient and energy-saving equipment, and green and environmentally friendly textile technologies, to reduce the pollution of production and save costs. These measures prevent and control pollution from the source, improving the competitiveness of green development of textile firms.

With the development of digital technology, data has become a basic strategic resource. Digital technology has brought about changes in the information mechanism. Digital technology is the starting point to support and promote digital transformation, which has a vital impact on the green innovation of textile firms [9]. Digital technology achieves incremental and radical green innovation by allowing textile firms to achieve core technology breakthroughs, reduce management costs, and save on energy consumption.

The application of digital technology can promote green innovation in multiple areas such as product development, and knowledge systems, thereby promoting the automation and upgrading of textile equipment [10]. These developments facilitate the "integration of informatization and industrialization" of firms and solve the key problems of radical green innovation [11]. Digital technology reduces the management and information retrieval cost for firms, triggering energy "conservation-oriented" technological progress. Digital technology enables R&D departments to improve communication and operational efficiency, achieve vertical and horizontal expansion of organizations, and accelerate green patent research, development, and innovation [12].

Knowledge search is a dynamic process of finding, analysing, and applying resources [13]. The process of knowledge search can be divided into knowledge mining, absorption, integration, and utilization [14]. According to the purpose of knowledge search, firms can form a proactive and a reactive search mode [15]. The "proactive" search mode is mainly reflected in the complex network that firms can use to develop new products and equipment and build network platforms in the context of digital intelligence. These actions expand the scope of resources available to firms and promote real-time connections between firms, companies, and virtual systems. In this manner, a complex network can be formed to break through existing knowledge limitations [16].

In comparison, a "reactive" search mode is mainly reflected in the further strengthening and improvement of the original firm to meet the needs of digital transformation [17]. The application of digital technology is conducive to the knowledge search of textile firms. With a deepening knowledge search, it will be more difficult for firms to absorb and apply new knowledge and technologies [18]. In the process of proactive knowledge search, firms lock in the scope of knowledge search according to emergency needs. Knowledge search through digital platforms can obtain richer knowledge information [19].

A rapid influx of new knowledge will lead to the problem of information overload and reduce the efficiency of information processing. Firms can use the new generation of information technology to establish a closed loop of data collection, transmission, storage, processing, and feedback, thereby breaking through the data barriers between various levels and different industries. This development improves the efficiency of knowledge retrieval [20]. The data-enabled connection ability can improve communication between

individuals in the firm, strengthening the close relationship between individuals and information, and promoting proactive knowledge search [21].

With the help of new technology, firms can quickly perceive the information needed by firms, reducing the time, manpower, and material resources for firms to find, absorb, and sort out new external knowledge. In this way, firms can identify diversified markets and technologies and reduce the cost of knowledge management [22].

In the process of reactive knowledge search, data processing capability plays a supporting role in the acquisition, integration, and utilization of resources and information by firms [23]. Therefore, digital technology can shorten the knowledge distance. With the help of digital technology, it is easier for textile firms in particular to obtain external information and innovative resources, thus increasing the possibility of integration and deep transformation of knowledge and improving the ability for reactive knowledge search.

Textile firms realize both radical and incremental green innovation in the process of knowledge search. On the one hand, knowledge search can provide firms with more novel and cutting-edge green technology data and allow firms to achieve radical green innovation [24]. Proactive search can strengthen the ability of firms to collect all types of green information in the external environment and obtain ideas for designing green products, new product sales channels, and potential markets [25].

On the other hand, textile firms can obtain the latest market information on upstream and downstream firms through knowledge search, thereby improving the competitiveness in green development. A reactive knowledge search enables firms to make full use of external knowledge sources, allowing the integration and application of various green and low-carbon technologies, and closely integrating green technologies with firms to form a driving force for incremental green innovation. The knowledge resources acquired in reactive search are integrated and applied to the process of incremental green innovation [26]. Reactive search enables firms to collect preliminary ideas about innovative modes from other firms in the market and improve their ability to transform products and improve services [27].

"Environmental dynamics" is a dynamic change in the environment caused by the complexity and instability of the external environment of the firm [28]. The concept covers customer needs, market changes, industry policies, the socioeconomic environment, and the technological development level of the external environment [28, 29]. The change of competitive advantage created by organizational capability depends on the dynamic change in the environment.

Consequently, the moderating effect of environmental dynamics in the green innovation process of textile firms is worth examining.

With the continuous increase of environmental dynamics, the impact of digital technology on green innovation of textile firms is enhanced. Environmental changes affect the overall operation of firms. Therefore, in a dynamic environment, the stronger the firm's digital technology and data management capabilities, the more accurate the understanding of macro-environmental changes such as industrial trends and environmental policies [29]. Textile firms rely on the accumulation of data resources, obtain demand information in real-time based on digital technology, analyse customer preferences, and develop environmentally friendly textile products in the market. In addition, these firms make predictive judgments on environmental protection needs and promote green innovation.

Based on the above analysis, this paper proposes the following hypotheses: first, digital technology has a positive impact on the green innovation (radical and incremental green innovation) of textile firms. Second, digital technology promotes green innovation by supporting knowledge search (proactive and reactive) in textile firms. Moreover, environmental dynamism positively moderates the impact of digital technology on the green innovation of textile firms (figure 1).

RESEARCH METHODOLOGY

Sample and data

Textile firms have gradually realized transformation and upgrading, adopting medium and high-end knitted fabrics as key areas of green development. Furthermore, green innovation has been encouraged as well as the development of textile firms under the guidance of digital technology. Data collection in this

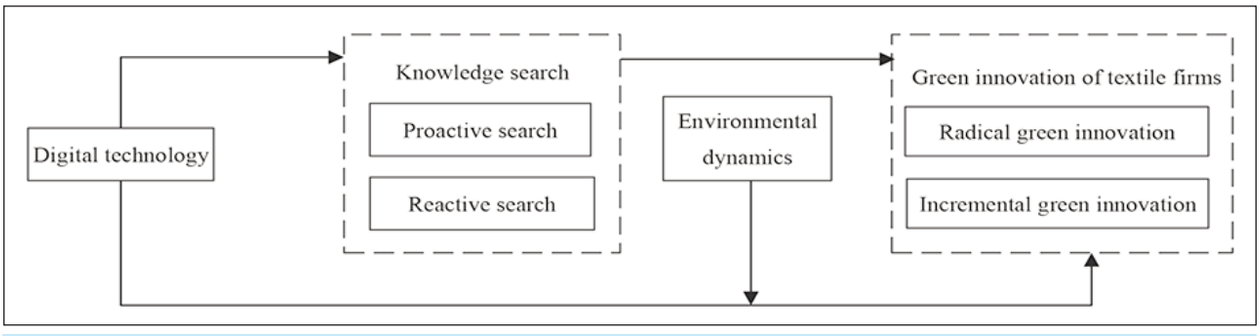

Fig. 1. Influence mechanism of digital technology empowering textile firms' green innovation

Table 1

SAMPLE DESCRIPTIVE STATISTICS							
Sample characteristics		**Frequency**	**Relative frequency**	**Sample characteristics**		**Frequency**	**Relative frequency**
Years of firm	Less than 10 years	59	26.1%	Firm scale	Small and micro firms	84	37.2%
	10–20 years	93	41.2%		Medium-sized firms	77	34.1%
	More than 20 years	74	32.7%		Large firms	65	28.8%
Form of ownership	State-owned firms	12	5.3%	Manager gender	Male	185	81.9%
	Private firms	214	94.7%		Female	41	18.1%

work has mainly adopted field research and the acquisition of questionnaires. The respondents chose textile firms with a high level of green innovation and complete production and processing by digital technology or digital platforms. In this study, the respondents are middle and senior managers of the firms. To add scientific rigour, 60 questionnaires were distributed for pre-survey before the formal collection of data. The questionnaire was improved based on the results of the pre-survey.

The study employed a longitudinal research method, and 300 questionnaires were distributed in two stages. The questionnaire was issued for the first time with questions relating to firm age, the scale of the firm, the form of ownership, and information related to digital technology. Overall, 259 questionnaires were recovered. The second questionnaire was issued a month later, including information on knowledge search, environmental dynamics, and green innovation of textile firms, with 226 questionnaires recovered. The effective recovery rate of the questionnaire was 75.33%. After completion of the survey, a total of 226 valid questionnaires were obtained. The sample characteristics are shown in table 1.

In the valid questionnaires, state-owned firms accounted for 5.3%, and private firms accounted for 94.7%. Males comprised 81.9%, and females accounted for 18.1% of respondents. In addition, the results show no serious homologous deviation.

Variables' measurement

Digital technology (DT)

Reviewing and analysing the measurement methods of existing literature [30], text mining methods were used to obtain the frequency of keywords related to the application of digital technology in the firm's annual report. The final sum of word frequency plus the logarithm of 1 is used to describe the degree of the firm's digital technology application.

Knowledge search

Referring to the scale of knowledge search studied by Luisa et al. [15] and Ricci et al. [21], and making some adjustments in line with the knowledge search situation of textile firms, eight items were finally determined to measure proactive search (*PS*) and reactive search (*RS*).

Green innovation

The measurement of green innovation (GI) is mainly based on the research of Urbinati et al. [8] and Mikalef et al. [10]. Six items were determined and measured from the two dimensions of radical green innovation (RI) and incremental green innovation (II).

Environmental dynamics

The measurement of environmental dynamics (ED) refers to the research of Wilden and Gudergan [31] and others, making appropriate adjustments according to the environmental externalities faced by textile firms. Four items are used to measure the environmental dynamics of textile firms.

In addition, referring to previous studies [3, 19, 28], the scale of firms and their financial characteristics may affect the green innovation of textile firms. Corporate assets can affect the basis for firms to invest social capital in firm innovation. The profitability and growth of firms play a key role in the green innovation of firms. In particular, a higher profitability and operating income growth rate are conducive to the realization of green innovation. Therefore, this paper chooses firm size (ES), asset size (ASSET), profitability (PROFIT), and firm growth (GROWTH) as control variables.

The classification standard of firm scale comes from the *Statistical Method for the Classification of Large, Medium, Small, and Micro Firms* (2017) issued by the Chinese National Bureau of Statistics. According to the firm, the number of employees, and the operation situation, the firm is divided into four types: large, medium, small, and micro, which are recorded as 1, 0.75, 0.25, and 0, respectively. The asset size (ASSET) is characterized by the natural logarithm of the total assets of the firm at the beginning of the period; profitability (PROFIT) is characterized by net profit/average asset; firm growth (GROWTH) is characterized by the growth rate of business income. The remaining variables were measured by a Likert 5 scale.

Reliability and validity test

The scales selected in this paper adopt the mature scales of domestic and foreign scholars and combine the textile firms to use digital technology to realize knowledge search and promote the specific situation of green innovation research to make appropriate

adjustments. In terms of questionnaire design, in addition to the basic information of the firm and the individual, each item adopts a Likert five-level scale (1 = Completely inconsistent, 5 = Fully consistent).
The Cronbach's α values of each variable in table 2 are all greater than 0.7, and the reliability is good. The factor load of each item exceeded 0.7. The average variance extraction (AVE) value of each variable was higher than 0.7, which met the requirement of a critical value of 0.5. The combined reliability value (CR) was greater than 0.7, and the validity of the scale was good. Among them, the minimum AVE value is 0.799, and its square root value is 0.894, which is higher than the correlation coefficient between factors, so the data pass the discriminant validity test. The model has a good fitting effect.

Correlation analysis

The correlation coefficient between variables (table 3) is within a reasonable range, which further verifies the relevant hypothesis proposed above.
The results of the multicollinearity test between variables show that the maximum variance inflation factor (VIF) of the regression coefficient is 3.524, which is far less than the critical value of 10. Therefore, there is no multicollinearity between variables.

Table 2

RELIABILITY AND VALIDITY TESTS

Dimensions	Items	Factor loading	AVE	CR	Cronbach's α
Proactive search [21]	Your firm actively explores new textile knowledge and market opportunities.	0.783	0.846	0.844	0.881
	Your firm strives to break the limitations of existing textile knowledge and production capacity.	0.824			
	Your firm takes the initiative to enter the field of emerging textile technology and explore new channels.	0.851			
	Your firm dares to bear the risk of knowledge search and application.	0.772			
Reactive search [29]	Your firm should improve the existing knowledge level and reserve according to the current needs.	0.859	0.826	0.917	0.821
	Your firm completes the improvement of reserve knowledge through knowledge search.	0.893			
	Your firm improves the existing textile technology through knowledge search.	0.912			
	Your firm improves the production process or process of printing and dyeing through knowledge search.	0.794			
Environmental dynamics [31]	Your firm is facing consumer demand and market preferences change quickly.	0.757	0.794	0.856	0.897
	The green technology transformation and upgrading of your firm is fast.	0.926			
	The emergence and promotion of new knowledge and technology in your industry is fast.	0.886			
	The relevant policies and institutional adjustments faced by your firms are frequently issued.	0.741			
Radical green innovation [17]	Your firm is trying new environmentally friendly textile products in the market.	0.799	0.816	0.799	0.834
	Your firm actively develops new environmentally friendly textile products.	0.805			
	Your firm agrees that textile products should meet the advanced environmental protection needs.	0.827			
Incremental green innovation [10, 30]	Your firm provides improved environmentally friendly textile products in the existing market.	0.859	0.892	0.903	0.782
	Your firm strives to improve the quality of supply of environmentally friendly textile products.	0.836			
	Your firm stage access to environmental management information supplies better textile products.	0.796			

Table 3

VARIABLES' DESCRIPTIVE STATISTICS AND CORRELATION COEFFICIENT TABLE (N=226)

Variables	1	2	3	4	5	6	7	8	9	10
1. Firm Scale	——									
2. Asset Size	0.267**	——								
3. Profitability	0.124*	0.105	——							
4. Firm Growth	0.132*	0.124	0.087	——						
5. Digital Technology	0.098**	0.158***	0.106	0.129	——					
6. Proactive Search	0.101	0.251	0.124	0.112	0.385**	——				
7. Reactive Search	0.097	0.103	0.211	0.083	0.299*	0.413*	——			
8. Environmental Dynamics	0.135*	0.058	0.059	0.034	0.246*	0.428*	0.256**	——		
9. Radical Green Innovation	0.162**	0.206**	0.247*	0.167	0.345*	0.314	0.483	0.256	——	
10. Incremental Green Innovation	0.179*	0.159*	0.281*	0.151	0.284**	0.497	0.211	0.354*	0.285	——
Mean Value	0.564	2.598	0.219	0.063	1.156	3.894	3.165	3.669	3.852	3.217
Standard Deviation	0.291	1.687	0.183	0.074	0.579	1.173	0.816	1.247	1.535	1.266

Note: N = 262, * denotes p < 0.1, ** denotes p < 0.05, *** denotes p < 0.01.

Regression model

To analyse the path of textile enterprises using digital technology to influence the green innovation of textile firms, we have established a multiple linear regression model. The quantitative expression can be constructed in the following form:

$$\begin{aligned} GI_{it} &= \alpha_0 + \beta_1 DT_{it} + \gamma_1 \sum CONT_{it} + \varepsilon_{it} \\ OB_{it} &= \alpha_1 + \beta_2 DT_{it} + \gamma_2 \sum CONT_{it} + \varepsilon_{it} \\ GI_{it} &= \alpha_2 + \lambda_1 DT_{it} \times ED_{it} + \gamma_3 \sum CONT_{it} + \varepsilon_{it} \\ GT_{it} &= \alpha_3 + \beta_3 DT_{it} + \tau_1 OB_{it} + \gamma_4 \sum CONT_{it} + \varepsilon_{it} \end{aligned} \quad (1)$$

Based on the effective sample data of textile firms, concerning other management statistical research methods, SPSS 22.0 and AMOS 24.0 statistical tools are used to analyse the characteristics of the sample data obtained. To ensure the reliability of the scale and the obtained data, descriptive statistical analysis, correlation analysis, and multiple hierarchical regression analysis were carried out to verify the direct effect of digital technology on green innovation of textile firms and the mediating role of knowledge search.

RESULTS AND DISCUSSION

The benchmark regression results are shown in table 4.

Table 4

BENCHMARK REGRESSION RESULTS

Variables	Radical Green Innovation(*RI*)			Incremental green innovation(*II*)		
ES	0.152* (1.73)	0.102* (1.75)	0.096* (1.68)	0.213** (2.31)	0.165* (1.84)	0.171* (1.77)
ASSET	0.098* (1.82)	0.056* (1.66)	0.071* (1.69)	0.102*** (4.85)	0.086*** (4.99)	0.093*** (5.51)
PROFIT	–0.076 (–1.21)	0.023 (0.89)	–0.051 (–1.35)	0.086 (0.57)	0.101** (2.13)	0.095** (2.28)
GROWTH	0.134** (2.36)	0.064* (1.98)	0.078* (2.04)	0.104 (0.62)	0.077 (0.64)	0.063 (0.84)
DT	—	0.264** (3.16)	0.251** (3.35)	—	0.367*** (4.28)	0.258*** (4.65)
DT*ED	—	—	0.103 (1.57)	—	—	0.124*** (2.96)
R^2	0.089	0.213	0.249	0.301	0.423	0.468
Adj. R^2	0.086	0.211	0.245	0.296	0.416	0.464
F	2.248	18.846	21.318	29.842	46.545	49.843
Max *V1F*	2.197	1.767	1.728	1.529	1.354	2.106
D-W	2.159	1.995	2.140	1.963	2.240	1.958

Note: * denotes $p < 0.1$, ** denotes $p < 0.05$, *** denotes $p < 0.01$, the same below.

The regression results show that digital technology has a significant positive impact on both incremental green innovation and radical green innovation. At the same time, environmental dynamism plays a positive moderating role in the process of digital technology affecting the radical green innovation of textile firms but does not play a moderating role in incremental green innovation. The reason is that, in a more turbulent environment, firms actively explore the power of new products and needs, thereby achieving the overall green innovation ability and technical level through knowledge search.

Hierarchical regression is used to verify the mediating role of knowledge search in the process of digital technology affecting green innovation. Table 5 shows the results of the moderated mediation effect test.

The application of digital technology can drive textile firms to carry out both proactive and reactive searches. Textile firms can complete knowledge searches with the support of digital technology and broaden the channels of knowledge learning and technology introduction. Therefore, the R&D activities of production technology such as green printing and dyeing in textile firms can be supported by new knowledge and technology.

A significant positive correlation is found between proactive search and incremental and radical green innovation. In particular, proactive search partially mediates the relationship between digital technology and both incremental and radical green innovation of textile firms.

In comparison, reactive search plays a partial intermediary role in the process of digital technology and incremental green innovation of textile firms. At the same time, reactive search does not play an intermediary role in the process of digital technology and radical green innovation of textile firms. The reason is that reactive search focuses on the improvement and perfection of existing technology and knowledge and may have less of an effect on the improvement of firm innovation.

The conclusion of the study once again verifies the findings of Mikalef et al. [10], Ghobakhloo [11] and Urbinati et al. [17] and other scholars on the mechanism of digital technology promoting green innovation. The results of this work point out that the improvement of digital technology plays an important role in the green innovation of textile firms. At the same time, this paper verifies the path of digital technology promoting green innovation through knowledge search, extending the results of Marques et al. [16], Foss [18] and other scholars on knowledge search. The findings of this study place digital technology, knowledge search, and green innovation in the same framework, offering a new path toward green innovation for textile firms.

The interaction between digital technology and environmental dynamics has a crucial relationship with the radical green innovation of textile firms. That is, the positive moderating effect of environmental dynamics on digital technology and radical green innovation is significant. However, environmental dynamism does not moderate the relationship between digital technology and incremental green innovation because the incremental green innovation of textile firms is mostly achieved through the efforts of firms to build strategic alliances and improve the existing technical level. The impact of environmental dynamics on firms' use of digital technology to achieve incremental green innovation is relatively small, and the impact of external uncertainty on the risk of green innovation is weak. Therefore, it is necessary to

Table 5

RESULTS OF THE MODERATED MEDIATION EFFECT TEST

Variables	*PS*	*RS*	*RI*		*II*	
ES	0.167* (1.68)	0.201** (2.28)	0.073* (1.86)	0.084** (2.97)	0.134* (1.83)	0.128* (1.85)
ASSET	0.098** (2.29)	0.146** (2.16)	0.065* (1.75)	0.071* (1.77)	0.053*** (4.69)	0.059*** (4.28)
PROFIT	0.131** (2.38)	0.098*** (5.57)	0.036 (1.43)	0.021* (1.69)	0.062* (1.89)	0.041* (1.92)
GROWTH	0.081* (1.84)	0.059** (2.36)	0.081* (1.92)	0.104 (1.57)	0.078 (0.76)	0.083 (0.99)
DT	0.315** (2.36)	0.263*** (6.21)	0.232** (2.15)	0.241*** (3.94)	0.174*** (5.35)	0.169*** (4.86)
DT*ED	—	—	—	0.105 (1.65)	—	0.105** (4.58)
PS	—	—	0.099*** (6.94)	0.075*** (5.73)	0.104** (2.42)	0.105*** (4.58)
RS	—	—	0.102 (1.60)	0.095 (0.73)	0.095*** (3.24)	0.092 (1.32)
F	32.845	39.946	27.523	35.362	54.673	50.253
R^2	0.354	0.384	0.267	0.336	0.483	0.452

strengthen the response speed of textile firms to the dynamic changes of the market environment, improve the ability of forward-looking search and responsive search, and promote the gradual green innovation and disruptive green innovation of textile firms.

Compared with the research results of Guo et al. [13, 14], this study further proposes to strengthen knowledge management and search activities from internal and external to promote green innovation of textile enterprises. Through the use of emerging digital and information technology to expand external cross-border search channels, textile firms can accelerate the development of intelligence and platform, and promote the application of digital and networked emerging technologies. This study expands the research results of Luisa [15]. Textile firms should use the industrial Internet to connect customers, suppliers, universities, research institutes, and other entities, break the boundaries of time, space, and organization, facilitate knowledge search and form knowledge associations among various entities, promote the improvement of products and services, and accelerate green innovation. Through digital technology and knowledge search, innovative green textile products are cultivated, the application of digital intelligent technology is promoted, and a new development model of green innovation in textile firms is effectively formed.

CONCLUSIONS

This paper mainly examines how digital technology facilitates knowledge search and promotes green innovation in textile firms. The use of digital technology by textile firms can encourage knowledge search that promotes green innovation. Moreover, digital technology has a significant effect on both the incremental and radical green innovation of textile firms. When distinguishing various types of knowledge search and green innovation, the influence mechanism of knowledge search on the green innovation of textile firms differs. Among the differences, proactive search is conducive to radical and incremental green innovation, with a stronger effect on radical green innovation. In comparison, reactive search is conducive to incremental green innovation.

Digital technology provides advanced tools and means for firms' proactive search. Therefore, digital technology is an important way for textile firms to realize the absorption, introduction, imitation, and application of new technologies. These developments provide a vital driving force for firms to realize both incremental and radical green innovation. Digital technology can also allow textile firms to complete reactive searches, further enlarging the original technological achievements and reserve knowledge resources of firms. Thus, digital technology plays an important guiding role in the sustainable green innovation of textile firms.

Knowledge search is not only positively affected by digital technology but also significantly promotes the green innovation of textile firms, which proves the relationship between digital technology, knowledge search, and green innovation. In addition, environmental dynamism positively moderates the impact of digital technology on radical green innovation. Environmental dynamics stimulate textile firms to actively try to develop new environmentally friendly textile products in the market and improve the level of proactive and reactive search of textile firms. The use of digital technology as a crucial means and tool promotes low-carbon green innovation in textile firms. Knowledge search plays a mediating role in the relationship between digital technology and green innovation in textile firms. Moreover, knowledge search is affected by the difference in the effect of digital technology, and the mediating effect of different knowledge search types varies.

As some statistics are not available, this paper conducted a questionnaire survey on managers of textile firms, obtaining data from 226 questionnaires. However, the industry selected by the sample does not include all textile firms, so the research results may have certain limitations. Due to the dynamic and lagging nature of knowledge search and the green innovation process, it can further collect longer-term continuous data in future research. In this manner, it can longitudinally analyse the statistical data of samples to dynamically examine the mechanism of digital technology promoting green innovation by empowering textile firms' knowledge search. Although this study considers the endogeneity of the data, the research concerning pathways to enhance competitiveness is insufficient.

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