



## RESEARCH ARTICLE

## The Affect Mechanism of Green Entrepreneurial Institutions on Technological Talents' Subsequent Entrepreneurial Intention in Northeast China

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ARTICLE INFO	ABSTRACT
Received: Oct 18, 2024	Sustainable entrepreneurship is important for future development, and the institutional environment is closely related to sustainable entrepreneurial intention. Therefore, based on the triadic reciprocal determinism, this study collected a sample of 3086 sustainable entrepreneurs in Northeast China through a purposive sampling method and web-based questionnaire. The relationship between green entrepreneurial institutions and technological talents' sustainable entrepreneurial intention, as well as the facilitating effects of digital resilience and environmental self-identity, were investigated. The results showed that green entrepreneurial institutions were positively related to technological talents' sustainable entrepreneurial intention, and digital resilience and environmental self-identity had facilitating effects. This suggests that entrepreneurs need the support of multiple green resources, namely, the degree of their connection to nature and the connection of having the ability to transform crises into opportunities, to adequately contribute to forming sustainable entrepreneurial intention in Northeastern China.
Accepted: Dec 3, 2024	
<b>Keywords</b>	
Technological talents	
Green entrepreneurial institutions	
Sustainable entrepreneurial intention	
Digital resilience	
Environmental self-identity	

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### INTRODUCTION

Sustainable entrepreneurship is an important means of promoting the development of shared prosperity in China (Huang et al., 2023; Han & Niu, 2023; Li & Long, 2024), and is an important activity to ensure long-term future economic development while taking into account environmental concerns (Dieguez, Sobral, & Conceição, 2023; Lopes, Suchek, & Gomes, 2023; Yasir et al., 2023). Researchers emphasize that sustainable entrepreneurship is an entrepreneurial activity that uses entrepreneurial means to solve problems such as poverty and pollution, and it does not only focus on economic benefits, but also on environmental and social benefits (Jahanshahi, Bhattacharjee, & Polas, 2023; Li, Murad, & Ashraf, 2023; Sharma et al., 2023). On the other hand, in the last few decades, researchers have realized that sustainable entrepreneurship not only creates economic

outcomes, but is also one of the important ways to address social and environmental issues such as poverty, pollution, and climate change (Ghodbane & Alwehabie, 2023; Shahid, 2023; Sharma et al., 2024).

In addition, to accelerate the construction of innovation centers, entrepreneurship of research talents has been emphasized globally with a series of attractive policy initiatives to create a sound entrepreneurship system (Ameer & Khan, 2023; Ishaq et al., 2024; Prasetyo, Azwardi, & Kistanti, 2023). The aim is to achieve the arrival and high concentration of technological talents and to promote the construction of high-level research, innovation, and entrepreneurship centers (Sarvari et al., 2024; Vasilescu, Dimian, & Gradinaru, 2023; Wu & Yu, 2024). Therefore, sustainable entrepreneurial intention has become an important measure of the effectiveness of high-quality entrepreneurship regimes in attracting technological talents (Dabbous & Boustani, 2023; Maheshwari, Kha, & Arokiasamy, 2023; Triyono et al., 2023). Therefore, it is particularly important to reveal the mechanism of the green entrepreneurial institutions on the technological talents' sustainable entrepreneurial intention (Ahmad, Idrus, & Rijal, 2023; Mohamed et al., 2023; Srivastava, Shivani, & Dutta, 2024). In addition, the technological talents' sustainable entrepreneurial intention has become a focus of attention for scholars in various countries as a result of the new wave of global science and innovation driven by the latest round of technological revolution and industrial change (Lim, Lee, & Mamun, 2023; Rafiana, 2024; Shi et al., 2024). However, although researchers have conducted a series of studies around the technological talents' sustainable entrepreneurial intention, it is still in the initial stage (Hogenstijn & Cuypers, 2023; Schaltegger, Loorbach, & Hörisch, 2023; Zhao et al., 2023), especially the lack of research on the technological talents' sustainable entrepreneurial intention and the process mechanism. Entrepreneurial willingness, as well as the exploration of process mechanisms (Holzmann & Gregori, 2023; Wach & Bilan, 2023; Yan, Huang, & Xiao, 2023), especially in Northeast China (Wang et al., 2023; Wei & Duan, 2024; Zhuang & Sun, 2023). As stated by Noor, Rabbani, and Dastgeer (2023), environmental problems caused by climate change are threatening the survival of all human beings, and although environmental awareness has increased, there is little practical action on sustainable entrepreneurship (Hossain et al., 2023; Malhotra & Kiran, 2023; Naznen, Mamun, & Rahman, 2023). Therefore, there is a need to focus on the entrepreneurial transformation approach and explore deeper, research that can more effectively contribute to sustainable entrepreneurship development (Aurellia & Nuringsih, 2023; Farell, Miralles, Vaziri, 2023; Reuther et al., 2023).

On the other hand, it has been found that green entrepreneurial institutions are positively associated with sustainable entrepreneurial intention (Yi, 2021). Whereas, sustainable entrepreneurial intention is related to ability, and perception (Bii, Mutai, & Rotich, 2024; Yasir et al., 2023). However, it is not clear the relationship between green entrepreneurial institutions and technological talents' sustainable entrepreneurial intention, and whether the relationship is affected by digital resilience and environmental self-identity in Northeast China.

In addition, Northeast China is currently experiencing a prolonged economic recession (Chen, Xi, & Fu, 2023; Gao & Taniguchi, 2023; Huo & Huang, 2023), and the main reason for this predicament is the lack of sustainable entrepreneurial talent, as well as problematic entrepreneurial institutions (Jiang & Sun, 2024; Li, Zhang, & Xiang, 2024; Yu et al., 2023). This is why the Northeast China region was chosen as the backdrop for this study, with the expectation of identifying the main factors and process mechanisms affecting the technological talents' sustainable entrepreneurship, and thus helping to re-energize the region's economy for the future.

Therefore, the purpose of this study is to investigate the level of green entrepreneurial institutions, as well as to observe their perceptions of sustainable entrepreneurial intention, and the facilitating effects of digital resilience and environmental self-identity, in Northeast China. Clarifying these

relationships will help to further enhance the commitment of technological talents to sustainable entrepreneurship and advance the theory.

## **2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT**

### ***2.1 Triadic Reciprocal Determinism***

Triadic reciprocal determinisms suggest that the environment, individual characteristics, and behavior can influence each other (Bandura, 1989). On the other hand, sustainable entrepreneurial intention reflects a commitment that includes the intention to create a sustainable new business from scratch or to re-establish a sustainable company in an existing organization (Yasir et al., 2023). Therefore, this study categorizes it as a behavior. In addition, green entrepreneurial institutions reflect the different types of policy support provided by government departments to entrepreneurs and businesses (Yi, 2021), categorized as environmental. On the other hand, digital resilience reflects the ability of individuals to recover from negative impacts and flexibly adapt to the environment (Park et al., 2018), categorized as capability. Also, environmental self-identity reflects the extent to which entrepreneurs perceive themselves as having an ecological identity or connection to nature (Wu & Mweemba, 2010), categorized as perception.

Thus, the interaction of green entrepreneurial institutions (environment) with digital resilience (capability) and environmental self-identity (perception) can influence sustainable entrepreneurial intention (behavior).

### ***2.2 Sustainable Entrepreneurial***

The role of entrepreneurship has gradually changed with the growing awareness of social and environmental challenges, and in addition to its traditional economic function, it has been given a more social function, where it is recognized as contributing to the achievement of social and environmental goals (Chaudhary et al., 2023; Emon & Khan, 2023; Klapper & Fayolle, 2023). Thus, the concept of sustainable entrepreneurship was created (Yi, 2021). It is also defined as identifying, creating, and utilizing opportunities to create future goods and services that sustain the natural and/or community environment and provide developmental benefits to others (Cai & Ahmad, 2023; Gupta, Gaurav, & Panigrahi, 2023; Reuther et al., 2023). In general, sustainable entrepreneurial ventures are characterized by two features: one, in the pursuit of its goals, it focuses on social and environmental benefits in addition to economic benefits (Arslan et al., 2023; Dawo, Long, & Jong, 2023; Vig, 2023). Sustainable entrepreneurial ventures endeavor to solve various problems, including poverty, environmental pollution, etc., through entrepreneurial means and obtain economic benefits based on this (Afum et al., 2023; Nguyen, Costanzo, & Özkan, 2023; Wulandari & Apriani, 2023). Second, in terms of the nature of the entity, it is essentially a self-sustaining enterprise (Baber, Ivanovici, & Lalangui, 2023; Berger & Blanka, 2024; Watson et al., 2023) Unlike organizations set up by government departments or private-public welfare organizations, sustainable entrepreneurial ventures must generate green revenues through the provision of commercial products or services (Apostu & Gigauri, 2023; Baiocco, Leoni, & Paniccia, 2023; Bakry et al., 2024)

### ***2.3 Green Entrepreneurial Institutions and Technological Talents' Sustainable Entrepreneurial Intention***

Sustainable entrepreneurial intention reflects a commitment that includes the intention to create a sustainable new business from scratch or to re-establish a company within an existing organization (Yasir et al., 2023). On the other hand, Green entrepreneurial institutions are considered to be: different types of policy support for entrepreneurs provided by government departments (Yi, 2021). Research has shown that green entrepreneurial institutions are positively associated with sustainable entrepreneurial intention (Yi, 2021). This is particularly important for sustainable entrepreneurs, as policy support determines the establishment and growth of sustainable businesses

in the context of economic transition (Emon & Khan, 2023; Iskandar, 2023; Lopes *et al.*, 2023). As Tan (2024) suggests, in terms of entrepreneurial support, financing policies, for example, can support technological talents to break through the constraints of insufficient resources in the early stages of business and stimulate their entrepreneurial inclination (Arya *et al.*, 2023). In addition, the support of the green system, such as giving financial support, which strongly supports the increase of sustainable entrepreneurial opportunities, is particularly important (Alshebami, 2023; Fallah & Soori, 2023; Tien *et al.*, 2023). Because green institutional support can promote entrepreneurs' behavior in line with sustainable values and thus guide them toward the future (Ameer & Khan, 2023; Audretsch *et al.*, 2024; Cai & Ahmad, 2023), it will be able to effectively reinforce them to establish new sustainable enterprises. Hence the hypothesis:

H1: Green entrepreneurial institutions are positively related to technological talents' sustainable entrepreneurial intention.

#### **2.4 The Moderator Role Played by Digital Resilience**

A possible factor contributing to the relationship between green entrepreneurial institutions and technological talents' sustainable entrepreneurial intention is digital resilience, it is considered to be an individual's ability to recover from negative impacts and flexibly adapt to the environment (Park *et al.*, 2018). Resilience has been found to facilitate the relationship between risk perception and entrepreneurial intentions (Song, 2023). As stated by Boh *et al.* (2023), digital resilience can help all types of subjects cope with the disruptions and challenges posed by digital technologies and digitization, and to adapt to and contribute to the process of digitization. The development of digital resilience can help individuals cope with the potential negative impacts of using digital technologies such as the Internet, adapt to their environment while maintaining their physical and mental health, and at the same time apply various digital technologies more effectively for their development (Lee & Hancock, 2023; Mols, Campos, & Pridmore, 2023; Soetekouw & Angelopoulos, 2024).

On the other hand, the level of digital resilience is likely to be higher because the green entrepreneurial institutions can provide entrepreneurs with diverse external resources, which will enhance their beliefs and confidence in the face of risk (Audretsch *et al.*, 2024; Emon & Khan, 2023; Iskandar, 2023). In addition, digital resilience is developed as individuals living in the digital age interact with the external space, which can facilitate individuals to adapt to external changes and continuously initiate external interventions and self-internal regulation (Xue *et al.*, 2023). As Xue, Zhao and Shen (2022) suggest, it can help individuals to continuously understand the new requirements of technological change and effectively cope with the latest risks it brings in the process of coping with change. The interaction of green entrepreneurial institutions with digital resilience to help them better adapt to complex and changing environments and increase their flexibility can further enhance entrepreneurs' beliefs and also continue to build capacity to adapt to the future (Shen, 2021; Xue *et al.*, 2022), which will ultimately further inspire their practice in sustainable entrepreneurship. Hence the hypothesis:

H2: There is a positive moderating effect of digital resilience between green entrepreneurial institutions and technological talents' sustainable entrepreneurial intention.

#### **2.5 The Moderator Role Played by Environmental Self-identity**

A factor that may be able to further promote technological talents' sustainable entrepreneurial intention is environmental self-identity, it is defined as the extent to which individuals perceive themselves as having an ecological identity or connection to nature (Wu & Mweemba, 2010). Research has shown that self-identity can facilitate the relationship between a supportive cultural environment and entrepreneurial intentions (Ndofirepi, 2021). This is because an individual's environmental positioning can trigger internal motivation to act accordingly, inspiring individuals to demonstrate their identity by carrying out environmentally friendly behaviors, so the higher an

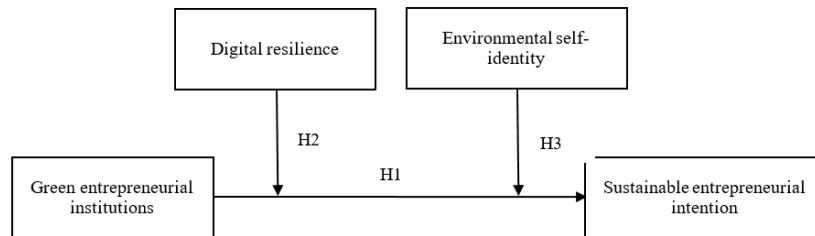
individual's environmental positioning, the higher the likelihood that they will demonstrate green or sustainable behaviors (Alshebami et al., 2023; Becerra, Carrete, & Arroyo, 2023; Lavuri, Akram, & Akram, 2023). Whereas the interaction between green entrepreneurial institutions and digital resilience strengthens individuals' adaptability and flexibility, it also strengthens their beliefs and regulation of their future entrepreneurship, which will facilitate the formation of their affective commitment to future sustainable entrepreneurship. As Tan (2024) suggests, improved institutional policy guidance can mold a positive entrepreneurial environment for technological talents and solve the problems they face in the early stages of their entrepreneurial endeavors, thereby strengthening their confidence in overcoming the difficulties of entrepreneurship and stimulating positive emotions towards sustainable entrepreneurial activities. Hence the hypothesis:

H3: There is a positive moderating effect of environmental self-identity between green entrepreneurial institutions and technological talents' sustainable entrepreneurial intention.

### 3. METHODOLOGY

#### 3.1 Research Framework

The research framework was constructed according to the research objectives and shypotheses (Figure 1).



**Figure 1. Research framework**

#### 3.2 Samples and Procedures

The survey was conducted in May-June 2024, with purposive sampling to select a group of research talents in Northeast China (Heilongjiang, Jilin, and Liaoning Provinces), and an electronic questionnaire was used to investigate their perceptions of green entrepreneurial institutions, sustainable entrepreneurial intention, digital resilience, and environmental self-identity, with a final valid sample size of 3086 (validity rate of 88.171%).

#### 3.3 Measures

Green entrepreneurial institutions Scale: Yi (2021) design, one factor, 4 questions ( $\alpha=0.948$ ). Green entrepreneurial institutions reflect the different types of policy support provided by government departments to entrepreneurs (Yi, 2021).

Sustainable entrepreneurial intention scale: Adapted from Yasir et al.'s (2023) instrument ( $\alpha=0.885$ ), one factor with 10 questions. Sustainable entrepreneurial intention reflects a commitment to either creating a sustainable new business from scratch or the intention to re-establish a company within an existing organization (Yasir et al., 2023).

Digital resilience scale: Designed by Chen et al. (2023), it is divided into 4 factors, tool use, information access, social engagement, and creative publishing, with a total of 20 questions ( $\alpha=0.821-912$ ). Digital resilience reflects an individual's ability to recover from negative impacts and flexibly adapt to the environment (Park et al., 2018).

Environmental self-identity scale: Designed by Werff et al. (2013), one factor, 3 questions ( $\alpha=0.77$ ). Environmental self-identity reflects the extent to which entrepreneurs perceive themselves as having an ecological identity or connection to nature (Wu & Mweemba, 2010).

The questionnaire was measured on a 5-point scale, self-rated, with gender, study abroad experience, and entrepreneurial success as demographic variables.

## 4. RESULTS

### 4.1 Distribution of Population Characteristics

The sample was predominantly female, accounting for 67.04% (2,069); the largest group had study abroad experience, accounting for 66.33% (2,047); and the highest proportion of the sample had one successful entrepreneurial experience, accounting for 71.16% (2,196).

**Table 1 Distribution of population characteristics**

Variables	Category	N	%
Gender	Male	1017	32.96
	Female	2069	67.04
Study abroad experience	Have	2047	66.33
	Not have	1039	33.67
Entrepreneurial success	1	2196	71.16
	2	837	27.12
	3 times and above	1017	32.96

Note. n=3086.

### 4.2 Model Fit

SRMR = 0.03, a good match.

**Table 2 Root mean square error**

	Primary sample	Mean	95%	99%
Saturated model	0.03	0.031	0.034	0.035
Estimated model	0.03	0.031	0.034	0.035

Note. \* $P < 0.05$ .

### 4.3 Correlation Analysis

Green entrepreneurial institutions are positively correlated with technological talents' sustainable entrepreneurial intention ( $\beta=0.564^{***}$ ;  $p<0.001$ ) and H1 is valid.

**Table 3 Correlation analysis**

Variable	M	SD	1	2	3	4	$\alpha$	CR
1. Green entrepreneurial institutions	3.482	0.729	<b>0.765</b>				0.733	0.804
2. Digital resilience	3.391	0.713	0.381 <sup>***</sup>	<b>0.763</b>			0.904	0.815
3. Environmental self-identity	3.302	0.778	0.483 <sup>***</sup>	0.253 <sup>***</sup>	<b>0.752</b>		0.906	0.861
4. Sustainable entrepreneurial intention	3.353	0.797	0.564 <sup>***</sup>	0.341 <sup>***</sup>	0.603 <sup>***</sup>	<b>0.778</b>	0.861	0.665
AVE			0.586	0.583	0.567	0.606		

Note. \* $P < 0.05$ .

### 4.4 Regulation Analysis

The significant ( $\beta=0.159^{***}$ ,  $p<0.001$ ) interaction between green entrepreneurial institutions and digital resilience (M3,  $R^2=0.372$ ,  $F=32.719^{***}$ ) suggests that digital resilience can contribute to the relationship between green entrepreneurial institutions and technological talents' sustainable entrepreneurial intention and H2 is valid. In addition, the interaction between green entrepreneurial institutions and environmental self-identity was significant ( $\beta=0.165^{***}$ ,  $p<0.001$ ) (M5,  $R^2=0.376$ ,  $F=34.082^{***}$ ), suggesting that environmental self-identity can promote the relationship between green entrepreneurial institutions and technological talents' sustainable entrepreneurial intention, and H3 is valid.

Table 4 Regulation Analysis

	Technological talents' sustainable entrepreneurial intention				
	M1	M2	M3	M4	M5
Gender	0.039	0.047	0.046	0.043	0.042
Study abroad experience	0.050	0.058	0.059	0.051	0.049
Entrepreneurial success	0.051	0.046	0.047	0.042	0.045
Green entrepreneurial institutions	0.551 <sup>***</sup>	0.502 <sup>***</sup>	0.493 <sup>***</sup>	0.513 <sup>***</sup>	0.469 <sup>***</sup>
Digital resilience		0.215 <sup>***</sup>	0.203 <sup>***</sup>		
Green entrepreneurial institutions × digital resilience			0.159 <sup>***</sup>		
Environmental self-identity				0.213 <sup>***</sup>	0.208 <sup>***</sup>
Green entrepreneurial institutions × environmental self-identity					0.165 <sup>***</sup>
$R^2$	0.373	0.392	0.372	0.342	0.376
Adj $R^2$	0.367	0.392	0.368	0.334	0.368
$F$	65.032 <sup>**</sup>	46.281 <sup>*</sup>	32.719 <sup>*</sup>	48.270 <sup>*</sup>	34.082 <sup>*</sup>
DW			2.039		1.983

Note. \* $P < 0.05$ .

As shown figure, digital resilience strengthens the relationship between green entrepreneurial institutions and technological talents' sustainable entrepreneurial intention.

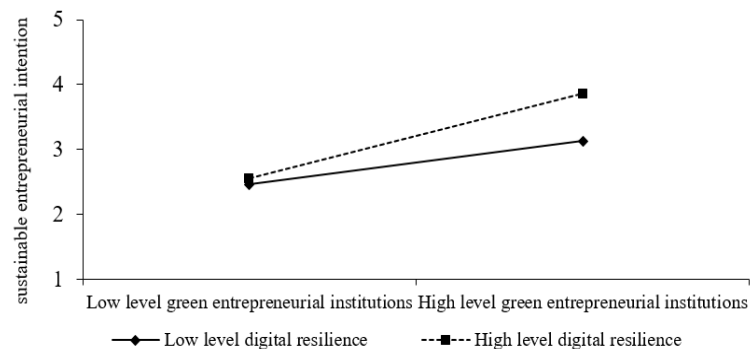
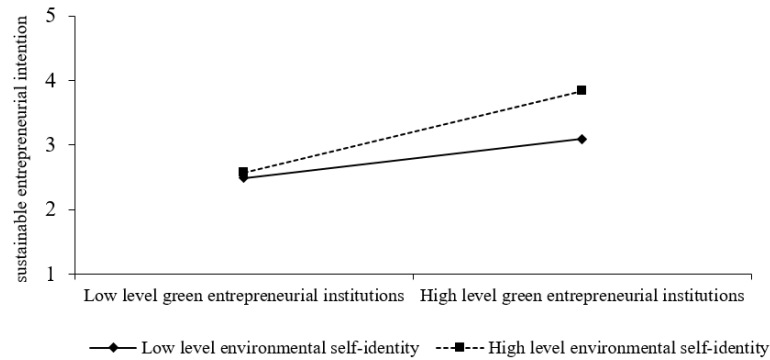


Figure 2: The moderating role of digital resilience

As shown figure, environmental self-identity strengthens the relationship between green entrepreneurial institutions and technological talents' sustainable entrepreneurial intention.



**Figure 3: The moderating role of environmental self-identity**

## 5. DISCUSSION

### 5.1 Discussion

This study investigated the perceptions of the green entrepreneurial institutions and technological talents' sustainable entrepreneurial intention in Northeast China, as well as the facilitating effects of digital resilience and environmental self-identity. First, the results confirm that green entrepreneurial institutions are significantly and positively related to the technological talents' sustainable entrepreneurial intention. Therefore, green entrepreneurial institutions as an external resource are particularly important for the practice of sustainable entrepreneurship of research talents. While previous studies have focused on the exploration of the antecedents of sustainable entrepreneurial intention, this study examines it in terms of its direct and facilitating factors, which effectively develops the theory. Secondly, the results found for the first time that digital resilience can facilitate the relationship between external green policies and technological talents' sustainable entrepreneurial intention. This may be because digital resilience can provide research talents with strong beliefs in their choice of sustainable entrepreneurship, as well as regulate their psychological state, which ultimately stimulates them to engage in sustainable entrepreneurship practices. Third, the study confirms for the first time that environmental self-identity can facilitate the relationship between green entrepreneurial institutions and technological talents' sustainable entrepreneurial intention. This may be because environmental self-identity strengthens bonding with external green resources and also strengthens their judgment, which stimulates their commitment to sustainable entrepreneurship.

### 5.2 Research Contributions

This study combines the *triadic reciprocal determinism* to explore the relationship between green entrepreneurial institutions and technological talents' sustainable entrepreneurial intention in Northeast China, and the facilitating effect of ability (digital resilience) and perception (environmental self-identity). The results confirm that green entrepreneurial institutions are significantly and positively related to the technological talents' sustainable entrepreneurial intention, and digital resilience and environmental self-identity have facilitating effects in Northeast China. This study contributes to the field of sustainable entrepreneurship as follows.

First, this study explores the relationship between green entrepreneurial institutions and the technological talents' sustainable entrepreneurial intention, as well as the promotion mechanism, using Northeast China as the background. This effectively contributes to the understanding of the field across cultures, and can also inform the future sustainable economic development of Northeast China.



Second, this study highlights the uniqueness of the technological talents' sustainable entrepreneurial intention and endeavors to understand the predicted impact of external green resources on it, as well as the facilitating role of digital resilience and environmental self-identity. This not only deepens the existing explanations of the prerequisites of sustainable entrepreneurial intention but also expands their intermediate paths.

Thirdly, the findings also expand the development of the *triadic reciprocal determinism* in the field of sustainable entrepreneurship, as this study constructs a model of influencing sustainable entrepreneurial intention in terms of the cross-level factors of environmental and individual characteristic differences, and behaviors, which effectively deepens the development of the theory in the field of sustainable entrepreneurship.

### **5.3 Implications**

#### **5.3.1 Practical Implications**

In the smart era, Northeast China must create green entrepreneurial institutions that can attract global tech talent. Specifically: First, it is recommended to introduce a series of breakthrough initiatives around entrepreneurship policy support, science and technology financial services, etc., to effectively provide high-quality policy supply for sustainable entrepreneurship of science and technology talents (Gazali & Zainurrafiqi, 2023; Wu & Yu, 2024; Zabelina et al., 2023).

Second, the local social norms and failure-tolerant sustainable entrepreneurship atmosphere can be made tangible to S&T talents by organizing events such as recognition conferences for outstanding sustainable entrepreneurs, as well as exploring better bankruptcy protection initiatives and credit repair mechanisms (Makhloufi, Zhou, & Siddik, 2023; Mondal, Singh, & Gupta, 2023; Xin & Gao, 2023).

Third, promoting universities, research institutes, and enterprises to jointly build sustainable education programs and training centers to continuously enhance the capacity and cognition of sustainable entrepreneurship of scientific and technological talents (Loorbach & Wittmayer, 2024; Podgórska & Zdonek, 2024; Rotondo, Giovanelli, & Ezza, 2023). In addition, initiatives to continuously optimize the system can be explored by focusing on digital resilience around their ability to build key points of the system. Specifically: First, continuously strengthen the capabilities of tech entrepreneurs by establishing entrepreneurship development programs for them (Wu & Yu, 2024; Zabelina et al., 2023); and address the concerns of tech entrepreneurs by introducing policies such as bankruptcy protection (Igbinenikaro & Adewusi, 2024). Secondly, entrepreneurial events to showcase the local successes of foreign talents to increase the expectation of others to come to the region (Gulzar & Fayaz, 2023; Luong & Lee, 2023; Perez et al., 2024); and regular forums for sustainable entrepreneurial talents to improve their knowledge of environmental protection, thus increasing their understanding of green ecology understanding (Surya et al., 2024; Tanveer, Yusliza, & Fawehinmi, 2024).

Fourth, showcasing sustainable industry projects in Northeast China (Yang et al., 2023), for technological talents through networking, field trips, etc., so that they can see the local market potential and future opportunities (Gai & Yang, 2023; Guo et al., 2023).

Fifth, establish a dedicated program for digital resilience learning for sustainable entrepreneurs. Digital resilience enables entrepreneurs to positively adapt to difficulties or challenges and maintain a better mental state (Isensee, Teuteberg, & Griese, 2023; Tim et al., 2023). Therefore, for the relevant authorities in Northeast China, there is a need to constantly think about how to guide sustainable entrepreneurs to adapt to the changes that may exist during the learning process, to adapt to the modern society's requirements for the competency structure of talents, and to enhance their digital resilience (Gulzar & Fayaz, 2023; Luong & Lee, 2023). As Tan (2024) argues, opportunities and challenges exist in the digital era, and cultivating sustainable entrepreneurs' ability to recognize and

adapt to changes will help them face the challenges with ease and turn crises into opportunities. Specifically, there are 3 suggestions: (1) guide sustainable entrepreneurs' self-regulation. They can be helped to develop a long-term learning plan for sustainable entrepreneurship, and consciously guided to set up plans and strategies that fit their learning goals (Neneh, 2024; Vershinina & Rodgers, 2023; Vesci et al., 2024); teachers of sustainable entrepreneurship programs can use formative assessment to allow them to adjust their self-regulation according to their own feedback checklist of stage-specific difficulties to regulate their learning, and give positive reinforcement incentives to sustainable entrepreneurs who can reasonably solve difficulties and cope with challenges, so as to motivate sustainable entrepreneurs to proactively master the pace of their learning (Qin, Zhang, & Lu, 2024); in the stage of self-reflection, the teachers can instruct them to reflect on and record the difficulties they encountered in their learning and the corresponding reasons, and guide them to adjust their learning program according to the reflection results to adjust the learning program (Kaffka & Krueger, 2024; Kross, Ong, & Ayduk, 2023; Stevenson et al., 2024)

(2) Promote positive perceptions of sustainable entrepreneurs. For the learning style itself, teachers can enhance their sense of experience and motivation through fun learning activities (Man, Berger, & Rachamim, 2024; Naqvi, Matriano, & Alimi, 2023; Wazni et al., 2023); and for the difficulties that may be encountered in the learning process, teachers can also help sustainable entrepreneurs through online environments or classrooms to help sustainable entrepreneurs develop the right awareness and enhance their strong will and positive cognition through various online and offline extracurricular activities (Badghish et al., 2023; Dabbous & Boustani, 2023; Thomas, 2023); for individual competencies, due to the specificity of learning, teachers can consider breaking down the complex knowledge points multiple times and increase their acceptability of what they have learned by designing progressive learning activities to enhance their beliefs (Liu et al., 2023), thus generating positive perceptions of personal competence (Isensee et al., 2023; Santos, Liguori, & Garvey, 2023).

(3) Guiding sustainable entrepreneurs to build good interpersonal relationships. For teachers in sustainable entrepreneurship programs, there is a need to provide them with learning and emotional support (Ávila, Davel, & Elias, 2023; Ho, Bryant, & Jiafang, 2024; Oksanen et al., 2023). First, in terms of learning support, teachers can take advantage of technology to recommend online learning tools for them and teach sustainable entrepreneurs to utilize web-based tools for learning, guiding them to engage in online learning and facilitating the construction of their knowledge (Li, Xie, & Li, 2022; Prasetyo, Azwardi, & Kistanti, 2023). Secondly, in terms of emotional support, teachers should also pay attention to their emotions, enhance the emotional interaction between teachers and students (technological talents), and encourage them to discuss their learning difficulties and identify coping strategies during the interaction (Fahrurrozi et al., 2023; Mawson, Casulli, & Simmons, 2023).

### **5.3.2 Theoretical Implications**

It is worth noting that the various global crises that have occurred in recent years have acted as catalysts for individuals to build digital resilience, which has led to an unprecedented focus on this concept (Lee & Hancock, 2023; Shen, 2021; Soetekouw & Angelopoulos, 2024). Therefore, the following recommendations are made for future research:

(1) Clarify the concept of digital resilience and distinguish between its different types. This concept, although it has received a great deal of attention in recent years, is still unclear about the concept of digital resilience. Firstly, whether the object of concern for digital resilience is the subject of digitalization or the digital technology system itself (Shen, 2021); and secondly, whether it involves 'impact' or 'empowerment' (Soetekouw & Angelopoulos, 2024; Tim et al., 2023). Therefore, in future research, it is necessary to further discuss the concept of digital resilience and differentiate between each type, to lay the foundation for further research.

(2) Establish an effective metric tool for digital resilience. In the field of management, there is a lack of recognized methods to measure digital resilience as its concept cannot be clarified (Xue et al., 2023). This has led to the current discussions on it mostly focusing on the qualitative level and lacking empirical studies (Shen, 2021; Xue et al., 2022). Therefore, subsequent related research should be in the establishment of a reasonable and effective measurement tool for digital resilience, to promote the in-depth development of this theory.

(3) Strengthen the attention and research on digital impact toughness. Most of the previous research on it is based on the perspective of digital empowerment, focusing on how different subjects apply digital technology to develop their resilience and cope with various unfavorable disturbances and shocks (Soetekouw & Angelopoulos, 2024; Xue et al., 2023). However, the development and application of digital technology will also bring corresponding threats and challenges, such as information security issues, technological disruptions, and changes in the obstacles brought about by the need for all types of subjects to have the appropriate resilience to cope with, to adapt to the development of the digital era (Chen et al., 2023; Lee & Hancock, 2023). However, there is a significant lack of research on resilience to digital shocks in previous studies (Shen, 2021; Xue et al., 2022). In addition, most of the current research emphasizes the positive impacts of digitalization while neglecting how to cope with its negative impacts (Lee & Hancock, 2023; Shen, 2021; Xue et al., 2023). Therefore, this study argues that both perspectives of digital resilience are essential, and future research on digital shock resilience should be strengthened.

#### **5.4 Limitations and Future Research Directions**

The main limitation of this study is that only cross-sectional data were collected, which is not persuasive enough to infer causality. In the future, a longitudinal tracking survey can be conducted on technological talents to understand the mechanisms that influence the formation of their sustainable entrepreneurial intention. Meanwhile, the data source of this study is still relatively homogeneous, and in the future, samples can be obtained from other regions in China for comparative analyses, to argue the differences in sustainable entrepreneurial intention across regions in China.

In addition, in future research, it is recommended to explore more antecedents and facilitating mechanisms of sustainable entrepreneurial intention, such as AI literacy, virtual team leadership, and belief in community of shared future for mankind, and conversely, the negative effects of digital shock resilience, such as loneliness, to maximize the exploration of potential factors that can influence sustainable entrepreneurial intention to meet the needs of the future economy in the long term.

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