ISSN: 2688-9323

Research on Enterprises' Behavioral Intension to Use Green Technology

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Abstract

In the context of carbon neutralization and carbon peak, promoting the application of green technology in enterprises is an inevitable choice for the development of the times. Based on the Technology Acceptance Model(TAM), by analyzing the relationship and influence of external variables, perceived usefulness, perceived ease of use, attitude toward using and behavioral intension to use. The results show that: external variables positively and significantly perceived ease of use. Perceived usefulness has a significant positive impact on the use attitude and behavioral of enterprises intension to use Green Technology. Perceived ease of use has a positive and significant impact on the use attitude of enterprises to use green technology. The use attitude has a significant positive impact on the behavior of enterprises intension to use Green Technology. Finally, this paper puts forward relevant suggestions to promote enterprises to use Green Technology.

Keywords

Green Technology; Technology Acceptance Model; Behavioral of Intension to Use.

1. Introduction

In the last century, in order to deal with the problem of environmental pollution, European and American countries explored many related environmental treatment technologies. Today, rapid economic development and continuous progress of human civilization. Green development is no longer a simple economic term, but has become the basic consensus of the development of human social civilization. Since the report of the 18th CPC National Congress, the construction of ecological civilization has been listed as an important topic. The 18th CPC National Congress pointed out that the construction of ecological civilization should be given a prominent position, and vigorously promote the construction of ecological civilization. Promoting green development is an inevitable choice for the construction of ecological civilization. From the perspective of enterprises, the fundamental way to promote green development is to rely on green technology, which is the technical basis of green development. Enterprises vigorously develop and apply green technology to drive green development.

China is the largest manufacturing country and largest carbon emission in the world. Xi Jingping expresses in the Climate Ambition Summit, we will promote China's economic transformation and promote high-quality social development in an all-round way. We will be down-to-earth and strive to reach the peak of carbon dioxide emissions by 2030 and achieve the goal of carbon neutrality by 2060. If enterprises apply green technology, it will promote China to achieve the goal of carbon neutralization and carbon peak.

ISSN: 2688-9323

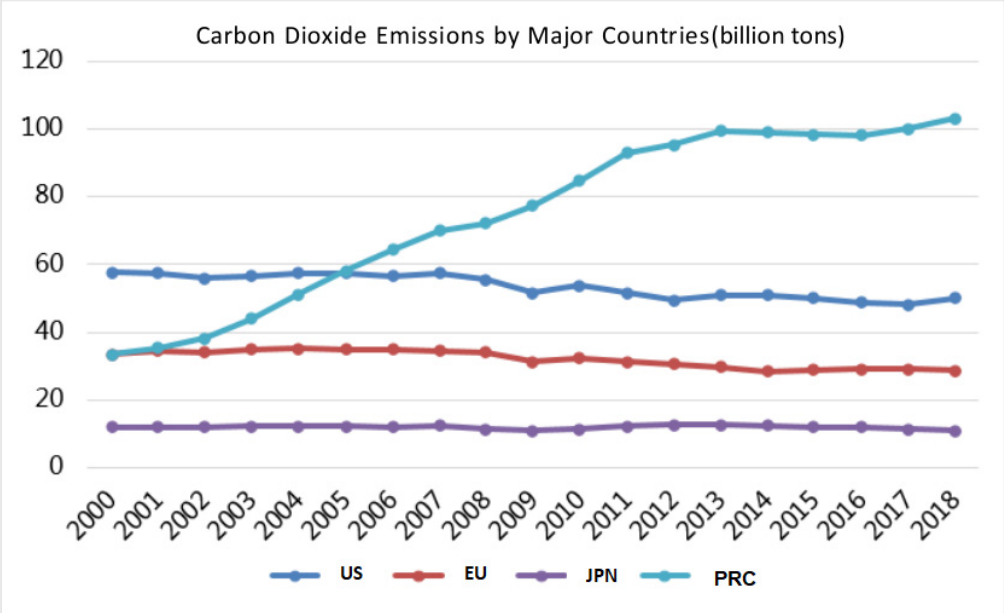

Figure 1. Carbon Dioxide Emissions Per Capita in Major Countries from 2000 to 2018
Data source: CSMAR carbon neutralization database - carbon dioxide emissions of major countries and regions in the world (year).

2. The Meaning of Green Technology

Green technology does not refer to a single technology. Instead, it includes a series of several technical fields or directions. It does not have a clear and unified concept academically. Most of them appear in the strategic planning of government departments or some research reports of international organizations [2].According to the documents of the national development and Reform Commission, green technology means that without violating the ecological principles and the laws of ecological economy. Green technology is an emerging technology that saves energy, reduces consumption, reduces pollution, improves ecology, promotes the construction of ecological civilization and realizes the harmonious coexistence between man and nature without violating the ecological principles and the laws of ecological economy. This includes energy conservation and environmental protection, cleaner production, clean energy, ecological protection and restoration, urban and rural green infrastructure, ecological agriculture and other fields. This covers the technology of product design, production, consumption, recycling and other links. Green technology is a new type of modern technology system coordinated with ecological environment system. Green technological innovation is becoming an important emerging field in the new round of global industrial revolution and scientific and technological competition.

The concept of green technology by Chinese scholars began in the 1990s, and scholars define green technology from different angles. Zhai Dewen believes that, Green technology represents the guidance of ecological values, Follow the ecological law, With reducing pollution, saving resources and maintaining ecological balance as the core, Relevant technologies to promote the harmonious and sustainable development between man and nature[3]. According to Wang Bolu, Green technology means that it can reduce pollution, Technical system to reduce consumption, control pollution or improve ecology [4]. According to Zhang Qingpu's research, green technology is a new modern technology system coordinated with the ecological environment system. it can not only reduce the marginal external cost of enterprise production, but also generally reduce the marginal internal cost of enterprise production [5].

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3. Theoretical Model and Model Establishment

Technology Acceptance Model (TAM) is a theoretical model proposed by Davis through user acceptance information system through assistant sexual behavior theoretical research in 1989.This paper uses this model to study the behavior of enterprises intension to use green technology.

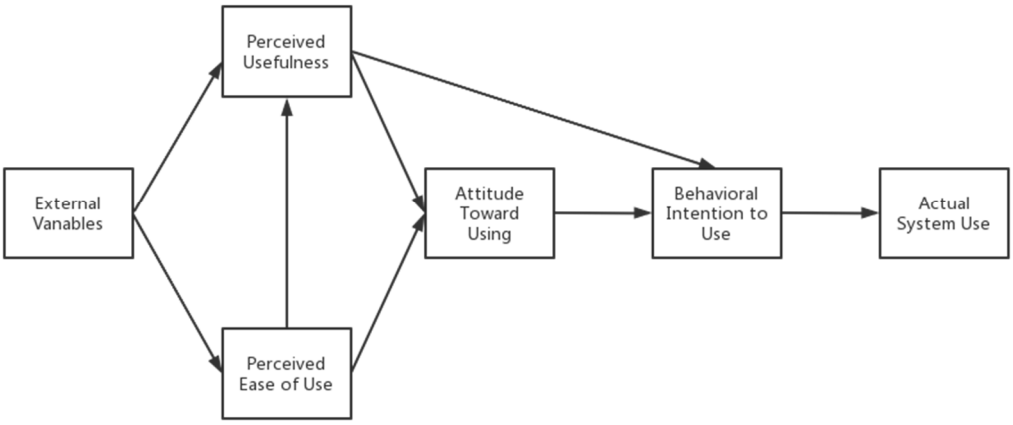

Figure 2. Technology Acceptance Model (TAM)

For further research, the external variables are defined as green technology cost, policy factors and personal factors.

TAM theory holds that: External variables affect perceived usefulness and perceived ease of use. Perceived usefulness refers to the fact that enterprises believe that the use of green technology can effectively reduce emissions, without affecting production efficiency or even improving production efficiency. Perceived ease of use means that enterprises do not need to spend a lot of energy to learn and apply green technology. Perceived usefulness is determined by perceived ease of use and external variables, Perceived ease of use is only determined by external variables. The technology acceptance model believes that the using of actual system is determined by behavioral intension to use. The behavioral intension to use is determined by perceived ease of use and perceived usefulness.

In this study, we mainly study enterprises' behavioral intension to use of enterprises to use green technology. Therefore, according to the logic of the model, we propose the following assumptions:

H1: The external variable has a positive impact on perceived usefulness.

H2: The external variable has a positive impact on perceived ease of use.

H3: Perceived Usefulness has a positive impact on the attitude of enterprises to use green technology.

H4: Perceived usefulness has a positive impact on the behavioral intension of enterprises to use green technology.

H5: Perceived ease of use has a positive impact on the attitude of enterprises to use green technology.

H6: Perceived ease of use has a positive impact on perceived usefulness.

H7: Attitude toward using has a positive impact on enterprises' behavioral intension to use green technology.

ISSN: 2688-9323

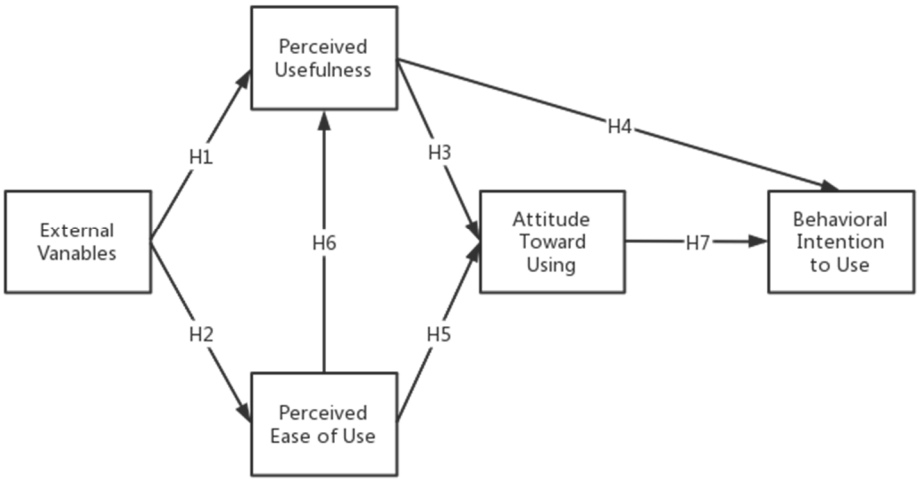

Figure 3. The Hypothetical Model of The Behavior of Enterprises Intension to Use Green Technology

4. Data Collection

4.1. The Method of Investigation

In this survey, we mainly investigate by visiting survey, asking relevant personnel and issuing questionnaires. We design the questionnaire according to the actual situation. Then, we modify and improve the questionnaire on the basis of pre survey, and form the final version. The questionnaire is mainly conducted through the network with the help of questionnaire software.

4.2. The Design of Questionnaire

Table 1. Specific Measurement Items of Variables

Variables	Measurement Index	Items
External Variables (EV)	EV1	The cost of green technology is acceptable
	EV2	The State supports enterprises to use green technology
Perceived Usefulness (PU)	PU1	Green technology can effectively reduce the carbon emission of enterprises
	PU2	Green technology reduces the production cost of enterprises
	PU3	Green technology improves the market competitiveness of enterprises
Perceived Ease of Use (PUE)	PUE1	Green technology is simple and easy to apply
	PUE2	The application of green technology has a short transition time
Attitude Toward Using (AT)	AT1	Green technology is helpful for the development of enterprises
	AT2	It is a very wise choice for enterprises to use green technology
Behavioral Intension to Use (BI)	BI1	If conditions permit, enterprises will use green technology
	BI2	In the future, enterprises will always use green technology
	BI3	I am willing to recommend green technology to other enterprises

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The questionnaire is divided into two parts: information and core variable. The core variable part is mainly to study the main factors in the model. There are two questions in the information part, twelve questions in the core variable part, and a total of 14 questions. Likert 5 scale was used in the questionnaire. There are five different answers to the statement of options, i.e., "strongly agree", "agree", "not necessarily", "disagree" and "strongly disagree", and the scores are recorded as 5, 4, 3, 2 and 1.

5. Data Analysis

5.1. Reliability Analysis

According to the table of reliability test results, confirmatory factor analysis (CFA) analysis was conducted for a total of 5 factors and 12 analysis items. The effective sample size of this analysis is 204, which exceeds 10 times the number of analysis items, and the sample size is moderate. The reliability of the collected data was tested. According to the table of reliability test results, it can be seen that nine standard load coefficients in the twelve personal analysis items are greater than 0. 7. The other three are greater than 0.68 and all showed significant, indicating that these analysis items have a strong correlation. The Cronbach's alpha value of the potential variable External variables (EV) is 0.696. The Cronbach's alpha values of the five potential variables: Perceived Usefulness (PU), Perceived Ease of Use (PUE), Attitude Toward Using (AT) and Behavioral Intension to Use (BI) are greater than 0.7. The overall reliability coefficient of the questionnaire is 0.934 and the reliability coefficient of the research data is higher than 0.9. It shows that the reliability of the questionnaire data is high and can be used for further analysis.

5.2. Validity Test

This study uses SPSSAU that is data analysis platform for data analysis through application intention research, and uses KMO and Bartlett test to verify the validity of the sample. It can be seen from the table of test results that the overall KMO value of the spherical test scale is 0.937, and the KMO value is greater than 0.8, indicating that this research data is very suitable for extracting information (it reflects good validity from the side). Bartlett's spherical test is significant at the level of 0.05, indicating that the sample data is very suitable for factor analysis. After confirmatory factor analysis (CFA) of the scale using data analysis tools, the overall model fitting effect is good. The factor load values of all potential variables are greater than the empirical value of 0.7, which fully proves that all observed variables can effectively reflect the characteristics of potential variables. According to the table of reliability test, the factor loads and mean variance extraction ave of 12 observation variables in this study are greater than 0.5, it is meeting the standard of convergence validity. And the combined reliability CR was greater than 0.700, which fully met the standard requirements of aggregate validity. This fully shows that the measurement scale of this study has good aggregate validity.

5.3. Structural Equation Model Analysis

Structural equation modeling is a multivariate statistical technique that combines factor analysis and path analysis. For many variables that cannot be measured directly, that is, what we call latent variables, the relationship between latent variables calculated by traditional regression analysis is not necessarily correct. The structural equation measurement model, which is more elastic than the traditional method, can deal with the potential variables and their indexes well. Structural equation model can not only deal with multiple dependent variables and estimate factor structure and factor relationship, but also estimate the fitting degree of the whole model.

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Table 2. Reliability and Aggregate Validity Analysis

Potential Variables	Measurement Index	Parameter significance Estimation					Factor load	Cronbach's Alpha	Composite Reliability	Average Variance Extracted
		Coef.	Std. Error	z	p	Std. Estimate				
External variables (EV)	EV1	1.000	-	-	-	0.783	0.750	0.696	0.703	0.544
	EV2	0.816	0.079	10.309	0.000	0.682	0.729			
Perceived Usefulness (PU)	PU1	1.000	-	-	-	0.684	0.740	0.746	0.752	0.508
	PU2	0.993	0.103	9.616	0.000	0.685	0.785			
	PU3	1.334	0.128	10.446	0.000	0.749	0.749			
Perceived Ease of Use (PUE)	PUE1	1.000	-	-	-	0.847	0.782	0.785	0.785	0.647
	PUE2	0.952	0.079	12.047	0.000	0.764	0.727			
Attitude Toward Using (AT)	AT1	1.000	-	-	-	0.793	0.798	0.775	0.775	0.633
	AT2	0.977	0.076	12.885	0.000	0.798	0.810			
Behavioral Intension to Use (BI)	BI1	1.000	-	-	-	0.809	0.780	0.820	0.821	0.606
	BI2	0.940	0.072	13.035	0.000	0.812	0.704			
	BI3	0.865	0.079	10.992	0.000	0.713	0.786			

Table 3. KMO and Bartlett Spherical Test Results

KMO and Bartlett's inspection		
Value of KMO		0.937
Bartlett Sphericity Test	Approximate Chi Square	1535.928
	df	66
	p-value	0.000

In order to test the effectiveness of significance, the ratio of the number of samples of the structural equation model to the estimated free parameters generally reaches or approaches the ratio of 10:1 [6]. The number of effective questionnaires in this study is 204.By "do you

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understand green technology" in the basic part of the option, the sample questionnaire of "never heard of" is removed, and the final number of samples for analysis is 168.

5.3.1. Fitness Test

Table 4. Main indicators of model fitting

Common Indicators	χ^2	df	p	Chi Square Degree of Freedom Ratioχ^2/df	GFI	RMSEA	CFI
Judgment Criteria	-	-	>0.05	<3	>0.9	<0.10	>0.9
Value	106.699	47	0.000	2.270	0.898	0.087	0.939

Hypothesis	Route	P-value	Significance
H1	External Variable (EV)→Perceived usefulness (PU)	0.873	Not significant
H2	External Variable (EV)→Perceived Ease of Use (PEU)	0.000	remarkable
H3	Perceived Usefulness (PU)→Attitude Toward Using (AT)	0.177	remarkable
H4	Perceived usefulness (PU)→Behavioral Intension to Use (BI)	0.430	remarkable
H5	Perceived Ease of Use (PEU)→Attitude Toward Using (AT)	0.476	remarkable
H6	Perceived Ease of Use (PEU)→Perceived Usefulness (PU)	0.923	Not significant
H7	Attitude Toward Using AT→Behavioral Intension to Use (BI)	0.004	remarkable

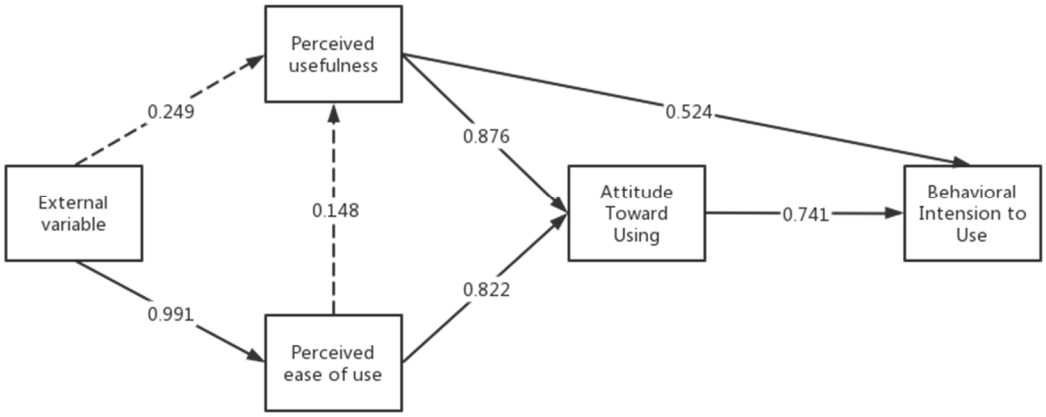

Figure 4. Model Structure

In order to verify the structural validity of the data and ensure the consistency between the sample data and the theoretical model, the 168 questionnaires collected were fitted with the research model using spssau data analysis platform. /df, GFI and RMSEA were selected as fitting indexes. The fitting index of each model is shown in the table below. According to the

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requirements of structural equation model (SEM) fitting index, the goodness of fit index of mean square and square root of progressive residuals CFI > 0.9, RMSEA < 0.05, comparative fitting index CFL > 0.9 and non-normal fitting index TLI > 0.9In the fitting index of the model, the ratio of chi square value to degree of freedom(χ^2/ DF) is 2.270 < 3; The values of SRMR and RMSEA are 0.048 and 0.087 respectively. it shows that the model can fit well. The fitness index CFI and CFI are greater than 0.9, indicating that the theoretical model proposed in this study has a very good fitness with the sample data.

6. Result Analysis and Suggestions

6.1. Result Analysis

Based on the technology acceptance model and combined with the structural equation model, this study studies the willingness of enterprises to use green technology, and explores the factors affecting the application of green technology. The following conclusions are drawn:

(1) The external variables of enterprises green technology have a significant impact on perceived ease of use, and the influence coefficient is 0.991, which is consistent with the original assumption of technology acceptance model. It also shows that when enterprises consider the application of green technology, the cost of green technology and the support of national policies will greatly affect entrepreneurs' decision-making. External variables have no significant impact on perceived usefulness, and there may be some data bias.

(2) Perceived usefulness has a significant positive impact on use attitude, and the impact coefficient is 0.876. This shows that enterprises pay more attention to the functionality of green technology when applying green technology. Therefore, through the function of green technology, enterprises can realize the value of green technology. Such as trying to improve the economic benefits of enterprises and optimize the structural needs of enterprises, so as to further increase the positive attitude of enterprises towards green technology.

(3) Perceived usefulness has a significant positive use intention, and the influence coefficient is 0.524. It indicates that the economic and social benefits brought by green technology to enterprises will affect the attitude of enterprises to apply green technology. When enterprises feel that green technology brings significant benefits to enterprises, enterprises have a positive attitude towards the using of green technology.

(4) Perceived ease of use has a significant positive correlation with the attitude toward using. That is, when green technology is relatively simple and easy to use and does not need a certain time and application cost to transition, enterprises have a positive attitude towards using green technology.

6.2. Suggestions

1) Enterprises should improve their understanding of green technology. At this stage, China is striving to implement the goal of carbon peak and carbon neutralization, and green technology has been effectively developed. To solve the problem of enabling enterprises to actively use green technology, first of all, enterprises should have a deep understanding of green technology, understand the important improvement role of green technology in society and even the global environment, and implement the green concept into enterprises, so as to improve the perceived usefulness of green technology, so as to improve the behavioral intension of enterprises to use green technology.

2) Green technology innovation to achieve the profit purpose of the enterprise. If the use of green technology can effectively increase the benefits of enterprises, it can fundamentally promote enterprises to use green technology. Enterprise green technology innovation can reduce the production cost and pollution discharge cost of enterprises, make them have better advantages in product price, and obtain the support of customers and market stakeholders, so

as to improve financial performance. By improving the function of enterprise green technology, we can create greater benefits for enterprises, improve the perceived usefulness of enterprise green technology, and effectively improve the behavioral intension of enterprises to use green technology.

3) Reduce the cost of green technology and optimize the structure of green technology. By reducing the of green technology to increase the attractiveness of enterprises to the use of green technology. At the same time, we should improve the perceived ease of use of green technology by optimizing the structure of green technology. Under the function of these two methods, the purpose of improving the use of green technology by enterprises is achieved.

4) Increase policy support. According to Guo Yuqing's research, fiscal and tax policies can play an incentive role. For example, we should encourage enterprises to apply green technology by guiding the investment of R & D funds from various parties, strengthening the supervision of subsidy funds, strengthening the green orientation of tax preference and improving the government green procurement system.

5) Improve the construction of carbon trading market and stimulate enterprises to actively reduce emissions by applying green technology. The state has made it clear that it is expected to further improve the construction of the national carbon market in about 10 years from 2020, and the national carbon trading market will enter a mature stage around 2030. In the future, more and more enterprises will enter the carbon market. It is the general trend for enterprises to use green technology to reduce carbon emissions. For the continuous improvement and construction of carbon trading market, enterprises will take the initiative to apply green technology and reduce emissions.

7. Conclusion

This paper constructs a model based on TAM and follows the framework of the survey model to investigate five measurement dimensions: external variables, perceived usefulness, perceived ease of use, use attitude and behavior attitude. By analyzing the correlation and interaction between these five variables, this paper puts forward some suggestions to promote enterprises to use green technology.

Acknowledgments

This work is supported the following fund:

2021 Innovative Entrepreneurship Project for College Students: Research on the driving factors of the application of green IT in Guangxi enterprises under carbon peaking and carbon neutrality goals (No, S202110595205).

Science Research Funds of Guilin University of Electronic Technology: Research on the driving mechanism, benefit and path of enterprise green IT application from the perspective of green development (No, US19007Y).

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