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Planned Behavior Theory-based Study on the Influencing Factors in Construction Waste Reducing Willingness—with Construction Workers as an Example

Jingkuang Liu [1*], Guokai Li [1], Huichong Li [1], Zhenshuang Wang [2]

[1] School of Management, Guangzhou University, Guangzhou 510006, CHINA

[2] School of Investment & Construction Management, Dongbei University of Finance & Economics, Dalian 116025, CHINA

[*] Corresponding author: ljkgowell@163.com

Abstract

China's economy has developed rapidly over the past four decades of reform and opening up. With Pearl River Delta urban agglomerations as the core representative, the urbanization has been promoted, witnessing massive construction of modern urban infrastructure and resulting in continuous accumulation of construction waste. Advocating circular economy development model is generally regarded as one effective way to solve the problem of construction waste, as it can alleviate resource shortage and environmental pressure caused by the continuously increased construction waste. Meanwhile, issues concerning construction waste reducing have attracted wide attention. According to the review of relevant literature, this paper analyzes the influencing factors in construction worker's willingness to reduce construction waste based on planned behavior theory, and constructs a preliminary research model. The results show that: (1) Perceived usefulness, perceived ease of use, compatibility, and personal responsibility exert positive effect on construction workers' attitudes toward construction reducing, with effect of perceptual usefulness most significant, compatibility second, and responsibility the weakest. (2) Interpersonal influence and external influence exert increasingly stronger effect on construction workers' reducing willingness in subjective normative perception. (3) Perceptual behavior control and behavioral intention in construction reducing have a direct impact on actual construction reducing behavior of construction workers. Where, perceptual behavior control in construction reducing exerts more significant effect on the actual construction reducing behavior compared to behavioral intention. (4) Self-efficacy, facility conditions, and financial incentives have a positive impact on construction workers' perceptual behavior control in construction reducing, which has a gradually increasing influence degree. (5) Subjective norms and behavioral attitudes towards construction waste have a direct impact on behavioral intention in construction reducing, perceived behavioral control has no significant effect on construction workers' behavioral intention in reducing, and subjective norms exert a more significant effect on behavioral intention in reducing compared to behavioral attitude. The research conclusions can serve as theoretical basis and decision-making reference for construction workers' reducing management on the construction site.

Keywords: construction waste, construction workers, planned behavior theory, reducing, behavioral willingness

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INTRODUCTION

With the rapid development of China's economy, China is now at the peak of modern urban infrastructure construction, with construction waste continuously increasing, especially in the Pearl River Delta region. According to *Environmental Protection Law of the People's Republic of China,* construction waste refers to the waste generated during the construction, reconstruction, expansion, and demolishing of buildings and municipal infrastructure, mainly including silt residue, waste concrete, waste asphalt, waste bricks, mortar, scrap metal, glass, plastics, wood, etc., mostly solid, semi-solid waste. In recent years, China has produced about 2 billion tons of construction waste in engineering construction, which has already accounted for about 40% of the total urban waste. China is now at the peak of urbanization, with its construction output stably maintained at the world first in recent years. Experts predict that China's current construction scale will continue for 20 years, which means the total consumption of construction production resources will

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continue to grow, and the total construction waste will also continue to increase.

At present, China's most construction waste is transported by the construction unit to rural areas or suburbs without any treatment, which is then landfilled or stacked, costing a lot of garbage clearing and freight fees. Meanwhile, the stacked construction waste not only causes air pollution, but also damages soil and water resources. Irreversible damage can be caused after circulation in water. The stacked construction waste in large amounts also affects city image. It is estimated that 600 tons of construction waste like waste bricks, cement blocks will be produced in China per 10,000 square meters of construction area at the current stage. According to the current international calculation methods, landfilling of 10,000 tons of construction waste requires 1 acre land. If calculation is made based on annual average construction waste production of 2.4 billion tons, China will need 240,000 acres of land annually to dispose of these construction wastes in the future. In addition, stacked construction waste will lead to decreased flood discharge capacity and surface drainage capacity. It is even possible that the land where waste has been dumped requires soil replacement for construction activities owing to decreased intensity, which will increase the construction cost and hinder urban sustainable development to some extent.

One of the most effective solutions to resource shortages and environmental problems caused by the continuous increase in construction waste is to promote circular economy. Circular economy in simple terms means constant recycling of resources to obtain huge economic value. According to the concept of circular economy, to achieve effective management of construction waste, we should meet the requirements of "reducing, resource, and harmlessness" under the principles of "Reducing, Reusing, and Recycling" ("3R" principle). That is, we should minimize the production of construction waste, rationally recycle the produced construction waste, and harmlessly dispose of construction waste using advanced technologies. Construction waste reducing means reducing of production and emissions of construction waste through overall management of the quantity, size, type, and hazardous substances of construction waste as well as clean production.

Peng et al. (1997) divided the construction waste management level according to the "3R" principle and different disposal methods for construction waste, and obtained a management hierarchy chart about construction waste. Reducing is put in the first place to reduce the construction waste production and realize waste reducing and prevention from the source. The available part of the generated construction waste is processed into product for continued use. Resources that cannot be used directly after simple processing should be recycled and technically processed to become a new product for recycling. When it is impossible to dispose of construction waste through reducing, reusing, and recycling, it can be landfilled after harmless treatment. As an earlier "construction waste reducing strategy from the source" advocated abroad, it aims to control construction waste production through effective measures and scientific management.

Hussey Skoyles (1974) believed that achieving comprehensive and effective waste management requires changed human behavior rather than technology. Afterwards, more and more scholars have carried out theoretical research on waste management. Many scholars have studied how to establish relevant theoretical models to analyze the operational mechanism of waste behavior willingness. With Pearl River Delta cities as the entry points and construction workers as the research subjects, this paper takes the engineering construction site as the research background to study the willingness in construction waste reducing. Through qualitative and quantitative analysis, the factors influencing behavioral willingness of construction workers in construction reducing are investigated to obtain the degree of influence of these factors on construction workers' willingness in reducing and identify interactions between the factors. Finally, constructive suggestions are put forward. The research results can not only provide reference for management strategy, policy-making and future research, but also effectively promote construction workers' reducing behavior, and control the construction waste production from the source, thus achieving circular economy development model.

LITERATURE REVIEW

Based on the theory of planned behavior, this study explores the influencing factors in construction workers' reducing willingness, which involves construction waste reducing-related theory and planned behavior theory. In terms of construction waste reducing technology and management methods, Jaillon et al. (2009) made comparative analysis of construction waste production based on traditional construction technology and prefabricated component technology, finding that the latter produced less than half of the construction waste compared to the former. Vivian et al.

(2007) analyzed the advantages and disadvantages as well as prospects of prefabricated component technology, concluding that prefabricated component technology can almost avoid construction waste production. Chen (2002) analyzed factors hindering the implementation of economic stimulus management and recorded reducing behavior of construction workers in the hope of improving construction workers' enthusiasm for reducing behavior through economic stimulation. Li et al. (2005) applied the widely used geographic information technology (GIS) and GPS technology in land consolidation and resource survey to construction waste, finding that the two technologies can effectively reduce the input of 10% labor while reducing waste production by more than half. Tan (2011) believed that green design and construction and recycling should be carried out to reduce construction waste production from the source. Based on behavioral awareness of "human", Chen (2008) discussed the differences in behavioral awareness among construction workers and its impact on construction waste reducing in the form of questionnaires. Li et al. (2010) investigated new construction projects in Shenzhen through on-site survey and interviews, and studied the effectiveness of reducing measures based on construction waste output indicators. As can be seen from the studies on construction waste reducing technology and management means, scholars have put forward their views on construction reducing from different perspectives, but the feasibility of the methods waits to be proved by practice.

In terms of economic analysis to promote reducing, taxation and government-encouraged economic measures, including landfill tax, natural building materials tax, government incentives, and tax relief, are currently the main economic instruments implemented. Pooh (2001) found that workers are not willing to implement source classification even in the face of high taxes, feeling it time-consuming and laborious. Kautto et al. (2004) studied the effectiveness of landfill charging policy in Finland, finding that enterprises would take the initiative to recycle the waste as implementation of landfill charges increases enterprise cost. However, fees set too high will lead to illegal dumping. Duran (2006) investigated the three recycling centers in Ireland by establishing an economic evaluation model, finding that economic means such as government subsidies and environmental taxes can promote construction waste reducing. Cooper (1999) pointed out methods to realize the recycling of construction waste include formulation of related policies and financial incentives in addition to taxation of natural raw materials. Wang et al. (2004) proposed to promote and instruct individuals and enterprises to reduce construction waste through economic policies such as landfill tax and natural resource tax. Gao (2004) studied foreign economic policies on recycling and waste reducing, holding that these two issues should be solved by various economic measures. Hao et al. (2008) studied the landfill fee policy implemented in Hong Kong in 2005 to promote construction waste reducing, finding that this policy reduced Hong Kong's construction waste by 60%. As can be seen from the studies on economical analysis of construction waste reducing, economic measures can promote construction waste management to a certain extent, but the current economic measures in China are not well-targeted with insignificant effect in overall.

In terms of institutional environment to promote construction waste reducing, Tam (2008) studied the impact of institutional construction on construction reducing with Hong Kong as an example, finding that "on-site waste management and recycling system" and "waste emission reduction system" achieved good implementation effect. Nevertheless, Barr (2003) found that policy systems such as legislation cannot thoroughly solve the ills in construction waste reducing. For example, legislative practice in the United Kingdom proves that realization of construction waste reducing requires the common participation of governments, companies, communities and individuals, which is impossible merely through government legislation. Seen from many domestic scholars' studies on institutional environment construction for construction waste management, China's current laws and regulations generally only serve as macro-instructions focusing on end treatment of pollution prevention and control, and lacking specific details on construction waste reducing. It can be seen from the above research literature that the relevant laws and regulations of construction waste management cannot fundamentally solve construction waste reducing problem, but the establishment of sound institutional environment can promote waste recycling. Meanwhile, the relevant laws and regulations in China play a limited role in construction reducing management.

In summary, despite the certain progress and achievements in studies related to construction waste, waste management problem has not been fundamentally solved. Implementation of construction waste reducing means great significance in achieving green development, reducing project cost and saving

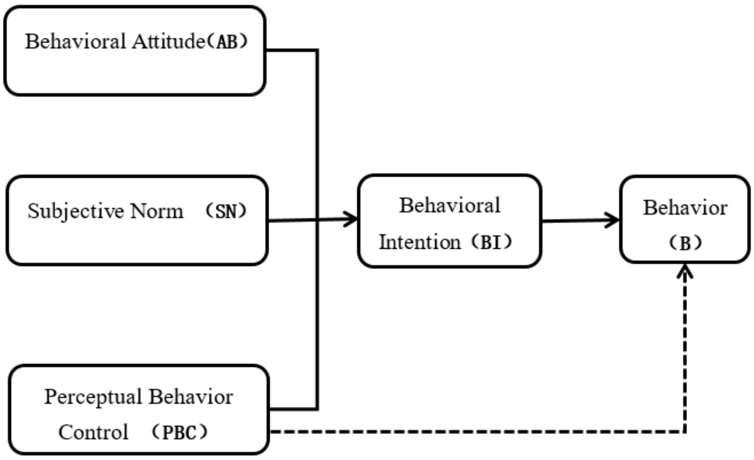

Fig. 1. Model of planned

social resources. However, its value and significance have not been widely recognized by society. Hence, the fundamental measure to solve the problem of reducing is to promote the formation of consensus in the society. Loosemore et al. (2002) found that personnel management is a key factor in waste reducing management during the construction phase, and changes in individual attitudes can effectively reduce or even avoid construction waste production. Therefore, this study focuses on behavioral willingness of construction reducing.

The TPB applied in many fields confirms its explanatory power and predictive power as a mature theory in the field of attitude behavior research. Therefore, based on planned behavior theory model, this paper further decomposes the three belief dimensions of behavior, norms and control with reference to decomposed theory of planned behavior, so that the influencing factors are more specific with systemicity guaranteed. Behavioral Attitudes (AB) are refined into Perceived Usefulness (PU), Perceived Ease of Use (PEOU), and Compatibility (COM). Subjective Norm (SN) is decomposed into peer impact (PI) and superior impact (SI). Perceptual behavior control (PBC) is decomposed into self-efficacy (SE), resource facilitation condition (RFC) and technical facility condition (TFC), as shown in **Fig. 1**. Since the three beliefs of behavior, norms, and control of planned behavior theory cannot always be presented in a single dimension, suitable adjustment is needed for the refined influencing factors according to the environment. This will not only satisfy the universal applicability requirement of planned behavior theory, but also more accurately explain and predict individual behavior. Therefore, based on the theory of planned behavior, this paper builds a theoretical model of decomposed planned behavior and explores in depth the factors that influence construction workers' willingness to reduce construction waste.

RESEARCH METHODS AND IDEAS

This paper makes statistical analysis of the collected questionnaire information using SPSS data statistical analysis software; tests variable reliability through Cronbach's α coefficient, that is, internal consistency of the data is tested; and measures validity of the item through factor analysis to ensure that the recycled questionnaire data can reflect the theoretical model constructed. Through correlation analysis, it measures degree of interaction among factors influencing construction workers' behavioral willingness in reducing, and detects influencing factors and its influence degree in construction workers' reducing behavioral attitude, behavioral intention, behavior, perceptual behavioral control, subjective norms using regression analysis.

This paper consists of five parts. The first part introduces the background of construction waste reducing in China and illustrates the significance of the study. The second part is the literature review, which sorts out the literatures in related fields at home and abroad in recent years, summarizes the influencing factors in construction workers' reducing willingness from the literature, and expounds the related behavior theories. In the third part, based on the sorting and analysis of relevant literature, a theoretical model is constructed based on the theory of planned behavior and hypotheses are proposed. The fourth part makes statistical analysis of the collected questionnaire information using SPSS data statistical analysis software; tests variable reliability through Cronbach's α coefficient; measures validity of the item using factor analysis to ensure that the collected questionnaire data can reflect the theoretical model constructed; measures degree of interaction among factors influencing construction workers' willingness in construction reducing, and detects influencing factors and its influence degree in construction workers' reducing behavioral attitude, behavioral intention, behavior, perceptual behavioral control, subjective norms using regression analysis. In this way, theoretical hypothesis proposed in the previous section is verified, the theoretical model is modified based on the empirical analysis results, and the final model of influencing factors in construction reducing willingness is obtained. Finally, conclusions of this study are summarized based on theoretical analysis and empirical tests, the reasons are investigated and recommendations for construction reducing management are proposed.

THEORETICAL MODELS FOR INFLUENCING FACTORS IN WILLINGNESS TO REDUCE CONSTRUCTION WASTE

This chapter re-adjusts the three refined dimensions of the three factors based on the influencing factors in behavioral attitude, subjective norms, perceptual behavior control according to planned behavior theory as well as relevant literature, and constructs the theoretical research model of this paper. Then hypotheses are proposed based on the theoretical model for each variable in the model. According to the expert interview and the results of the pre-test questionnaire, the survey questionnaire is revised to obtain the final survey questionnaire as shown in the Appendix.

Theoretical Model

Preliminary model

1. Construction Workers' Behavioral Attitude towards Waste Reducing

Construction workers' behavioral attitude refers to the positive and negative feelings that construction workers hold for reducing construction. In decomposed planned behavior theory, behavioral attitudes are divided into three dimensions: perceived ease of use, perceived usefulness, and compatibility. In the study on construction personnel's construction reducing behaviors, Zhu et al. (2012) refined the behavioral beliefs in reducing attitudes into three aspects: sense of responsibility, corporate value, and environmental awareness. According to Tan (2011), influencing factors in individual construction reducing behavior include environmental values, behavioral costs, sense of responsibility, motivation, personal and social norms, and cognition of problem solution. Chen (2008) interpreted behavioral attitudes in the theoretical framework of construction reducing as pattern of manifestation in five aspects which are responsibility sense, environmental awareness, behavioral beliefs, initiative, and behavioral consequences assessment [17]. Based on the above literature sorting, the text refines behavioral attitude towards construction reducing into seven aspects which are perceptual ease of use, perceptual usefulness, compatibility, environmental awareness, reducing behavioral costs, corporate value, and personal responsibility.

2. Construction workers' subjective norms in waste reducing

Subjective norms refer to construction workers' perceptions about the pressure given by social groups or important others when deciding whether to implement reducing construction. It reflects construction workers' impact from outside groups when performing reducing actions. Decomposed planned behavior theory subdivides subjective norms into two dimensions: superior influence and peer influence. In the behavioral framework of construction reducing, Chen (2008) interpreted subjective norms as patterns of manifestations in four aspects: compliance motivation, normative beliefs, corporate culture and policy levels. In the study on construction workers' construction reducing behaviors, Zhu et al. (2012) considered three aspects in subjective norms of reducing willingness: leadership, owners and fellow workers. Zeng (2013) considered subjective norms of government, company, market, and society in the green building development research in real estate. Based on the above literature sorting, the text refines the subjective norms of construction waste reducing into two aspects: external influence and interpersonal relationship. Interpersonal relationships were taken into account the influence of superiors and peers, including leaders, owners, and colleagues of construction workers; external influences consider both laws and regulations and socio-cultural environments.

3. Construction Workers' Perceptual Behavioral Control of Waste Reducing

Perceptual behavioral control refers to the degree of difficulty a construction worker expects in performing reducing behavior. It reflects the ability of a construction worker to perceive influencing factors that promote or hinder reducing behavior. The decomposed planned behavior theory subdivides perceptual behavior control into three dimensions: resource facility condition, self-efficacy, and technical facility condition.

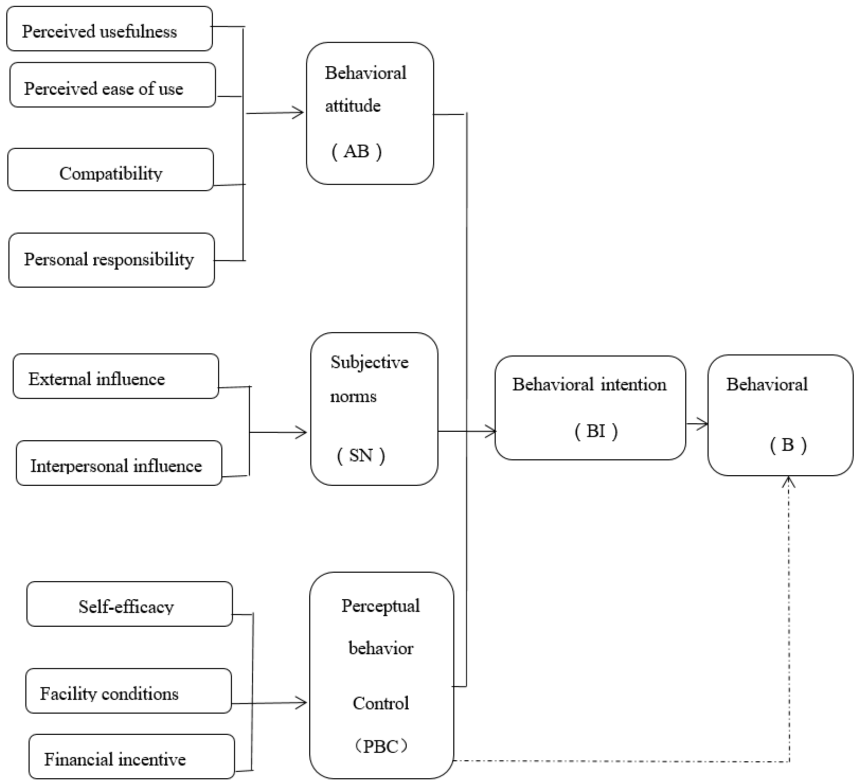

Fig. 2. Theoretical model for the study on influencing factors in construction workers' reducing willingness

Osmani (2008) found in investigation on British architects that financial incentives can effectively promote the implementation of construction reducing. Vivian (2007) found in the study on construction workers' waste management awareness that the implementation of "step-by-step incentive system" can reduce construction waste production by more than one fifth. Therefore, financial incentives will also be incorporated as one aspect of perceptual behavioral control. Based on the above literature sorting, the text summarizes the perceptual behavioral control of construction waste reduction into four aspects: resource facility condition, financial incentives, self-efficacy, and technical facility condition.

Modification of the preliminary model and establishment of the final model

In order to complement the influencing factors in construction workers' willingness to reduce waste and optimize the initial model, one visit was made to the construction unit leaders and construction personnel, and the preliminary model was revised according to the interview results. In terms of behavioral attitudes, the study subjects are individual construction worker. "Corporate value" refers to the value that individual's reducing behavior brings to the company, which is thus not considered in the behavioral attitude; "environmental awareness" refers to environmental protection value brought about by individual's reducing behavior, which is essentially a manifestation of usefulness and can be classified as "perceived usefulness." "Cost of reducing behavior" refers to the efforts made by construction workers to carry out reducing activities, which has overlapping with the degree of difficulty construction workers with "perceived ease of use" predict in reducing behavior, and can thus be classified as "perceived ease of use". In terms of perceptual behavior control, "technical facility condition" and "resources facility conditions" are based on objective and convenient conditions, but have different measurement perspectives, which can hence be classified as "facility conditions." Thus, the final theoretical model for the study on influencing factors in construction reducing willingness is obtained by improving the preliminary theoretical model, as shown in **Fig. 2**.

Research Hypothesis

According to the research model of influencing factors in construction workers' willingness in construction reducing, hypotheses are proposed for the study on influencing factors in construction workers' reducing willingness with reference to relevant literature's statement of behavioral willingness research hypotheses, as shown in **Table 1**.

Table 1. Research hypotheses on the influencing factors in construction workers' reducing willingness

Hypothesis	Statement
H1	Construction workers' perception of perceived usefulness in willingness to reduce construction waste has a positive impact on attitudes towards reducing willingness
H2	Construction workers' perception of perceived ease of use in willingness to reduce construction waste has a positive impact on attitudes towards reducing willingness
H3	Construction workers' compatibility in willingness to reduce construction waste has a positive effect on reducing willingness.
H4	construction workers' sense of responsibility in willingness to reduce construction waste will positively affect attitudes to reducing willingness
H5	The external influences perceived by construction workers have a positive effect on the subjective norms in reducing willingness
H6	Construction workers' perceived interpersonal influence has a positive impact on subjective norms in reducing willingness
H7	Construction workers' perception of self-efficacy in waste reducing willingness has a positive impact on perceptual behavioral control of reducing willingness
H8	construction workers' facility condition in construction waste reducing willingness has a positive effect on perceptual behavioral control.
H9	Financial incentives in construction workers' construction waste reducing willingness has a positive effect on perceptual behavioral control of reducing willingness
H10	Construction workers' behavioral attitudes to construction waste reducing willingness has a positive impact on behavioral intention in reducing
H11	construction workers' perception of subjective norms in construction waste reducing willingness has a positive effect on behavioral intention in reducing
H12	construction workers' perception of perceptual behavioral control in construction waste reducing willingness has a positive impact on behavioral intention in reducing
H13	construction workers' perception of perceptual behavioral control in construction waste reducing willingness has a positive impact on the occurrence of reducing behavior
H14	Construction workers' behavioral intention in construction waste reducing has a positive impact on the occurrence of reducing behavior

Questionnaire Design

This paper sorts out and summarizes the influencing factors in construction workers' reducing willingness, and designs a survey questionnaire based on theoretical model. According to the research scenario in this paper, data was acquired via interview and field surveys, and the predecessors' research measurement scales and questionnaire items were appropriately revised to obtain the initial measurement questionnaires for each variable. The main part of the initial questionnaire adopts Likert five-point rating method to measure the model. A higher score indicates higher recognition towards the item expression. To ensure that measurement of the targets and contents is possible in each item, the validity and reliability of the questionnaire need to be tested. In this study, a new construction project in Nanhai District, Foshan City was selected for the questionnaire pre-test, and 55 valid questionnaires were collected. The initial questionnaire items were filtered through reliability test and factor analysis, deleting PU3 (implementation of construction reducing can establish corporate image), COM3 (currently, I need to implement construction reducing), FC1 (I can obtain the resources needed for construction reducing in construction). Twenty-six measurement indicators were finalized, and the formal scale of **Table 2** was obtained.

Table 2. Variable Measurement Questionnaire on Construction Worker's Waste Reducing Willingness

Influencing Factors		Variable	Questionnaire Items
Behavioral attitude AB		AB1	It is a good idea to promote construction waste reducing in construction
		AB2	I like to take construction waste reducing actions during construction
	Perceived usefulness PU	PU1	Promotion of construction reducing in construction can reduce waste production
		PU2	Promotion of construction reducing in construction can play a role in protecting the environment
	Perceived ease of use PEOU	PEOU1	I can easily implement waste reducing in construction
		PEOU2	I can easily learn how to implement construction waste reducing.
	Compatibility COM	COM1	Implementation of construction reducing coincides with my environmental protection values
		COM2	My experience will affect my implementation of construction reducing
	Personal responsibility PR	PR1	I have responsibility to implement construction waste reducing during construction
		PR2	I will be guilty if my failure to implement construction reducing affects the environment
Subjective norm SN		SN1	化 People who have an influence over my behavior agree with my implementation of reducing in construction.
		SN2	I take construction reducing actions owing to the effect of laws and regulations and the socio- cultural environment
	External environment EI	EI1	The cultural environment for the sustainable development of the entire society grows richer
		EI2	Public opinion on social environmental protection urges me to implement reducing
	Interpersonal influence II	II1	Leaders and colleagues consider it a good idea to implement construction reducing
		II2	When owners, leaders, and colleagues need me to implement reducing, I will try to implement it.
Perceptual behavior control PBC		PBC1	Whether reducing is implemented in construction is under my control
		PBC2	My implementation of construction waste reducing is hindered by many factors
		PBC3	My knowledge, ability and resources allow me to reduce construction waste in construction
	Self-efficacy SE	SE1	I can implement construction reducing in construction with my own ability
		SE2	I believe that I can overcome the difficulties and implement construction reducing.
	Facility conditions FC	FC1	I have time to take waste reducing actions during construction
		FC2	Because of the lack of reducing methods and techniques, it is difficult for me to implement reducing in construction.
	Financial incentive FI	FI1	company will reward me for waste reducing in construction
		FI2	Owners will reward me for waste reducing in construction
behavioral intention BI		BI1	In the future, I plan to take reducing actions to avoid waste in construction
		BI2	I am interested in joining promotion and learning activities on construction waste reducing
		BI3	I would like to advise the leadership on how to reduce waste during construction
behavior B		B1	I talked to the leaders about how to reduce waste in construction
		B2	I have implemented construction reducing in the past year

EMPIRICAL STUDY ON THE INFLUENCING FACTORS IN CONSTRUCTION WASTE REDUCING WILIINGNESS

Questionnaire Survey and Preliminary Analysis

The study of this paper takes the front-line construction workers in the Pearl River Delta as the investigation subjects, so it is impossible to issue

Table 3. Specific composition of the survey samples (N=181)

characteristics	category	number of people	percentage
age	18-25 years old	47	26%
	26-35 years old	25	14%
	36-45 years old	75	41%
	46-60 years old	34	19%
Length of service	Less than 5 years	50	28%
	5-10 years	78	43%
	11-15 years	33	18%
	More than 15 years	20	11%
Type of work	Concrete worker	29	16%
	Steel fixer	20	11%
	Bricklayer	53	29%
	Others	79	44%
Education level	Junior high school and below	129	71%
	High School and Technical Secondary School	43	24%
	Junior college and above	9	5%

Table 4. Reliability and validity analysis indicators of latent variables

Latent variable	Observed variable	Factor load	P value	Cronbach's α	KMO value
Behavioral attitude	AB1	0.806	***	0.946	0.50
	AB2	0.796	***		
Perceived usefulness	PU1	0.793	***	0.969	0.779
	PU2	0.654	***		
Perceived ease of use	PEOU1	0.529	***	0.984	
	PEOU2	0.539	***		
Compatibility	COM1	0.682	***	0.963	
	COM2	0.747	***		
Personal responsibility	PR1	0.524	***	0.938	
	PR2	0.829	***		
Subjective Norms	SN1	0.800	***	0.943	0.50
	SN2	0.566	***		
External influence	EI1	0.543	***	0.932	0.720
	EI2	0.552	***		
Interpersonal influence	II1	0.706	***	0.894	
	II2	0.628	***		
Perceptual Behavior Control	PBC1	0.542	***	0.800	0.724
	PBC2	0.745	***		
	PBC3	0.675	***		
Self-efficacy	SE1	0.524	***	0.862	0.716
	SE2	0.860	***		
Facility condition	FC1	0.722	***	0.936	
	FC2	0.583	***		
Financial incentive	FI1	0.564	***	0.806	
	FI2	0.525	***		
Behavioral Intention	BI1	0.685	***	0.805	0.713
	BI2	0.669	***		
	BI3	0.863	***		
Behavior	B1	0.753	***	0.846	0.50
	B2	0.638	***		

Note: "***" indicates a significance level below 0.001

questionnaire on a large scale and without object. For increased questionnaire effectiveness, the questionnaire's item settings are designed to be as easy to understand as possible. With questionnaire directed to the construction workers of on-going construction projects in Pearl River Delta cities like Guangzhou, Shenzhen, Foshan, Zhuhai, Dongguan via the help of classmates and friends, the author also personally went to construction units to issue the questionnaire. At the end of the study, 216 questionnaires were collected and 181 were valid, with an effective rate of 83.8%. The investigated sample characteristics include age, length of service, degree of education, and type of work. The specific composition is shown in **Table 3**.

Reliability and Validity Test

In the theoretical model, one variable corresponds to multiple items, and whether each item can measure this variable consistently requires reliability test of its internal consistency. The questionnaire data was subject to reliability analysis and KMO and Bartlett tests using SPSS 22.0 statistical analysis software. It can be seen from **Table 4** that Cronbach's α coefficients of all potential variables are all above 0.8, indicating high reliability of the questionnaire. In terms of validity, KMO and Bart spherical test results showed KMO values of all latent variables greater than or equal to 0.5, and the Bart's test result was significant at the 0.05 level ($P<0.05$), indicating the suitability for factor analysis. Secondly, factor analysis of the latent variables was performed using AMOS21.0, revealing factor load of all observed variables above 0.5, indicating that the latent variables can be effectively measured by the observed variables, so the setting of each items in this study has good construct validity.

Correlation Analysis and Regression Analysis

The questionnaire validity and reliability analysis results show that the research model can be further empirically analyzed. Next, with Pearson correlation coefficient as a carrier, correlation analysis is used to measure the degree of closeness between latent variables. If the relationship between variables is significant, multiple linear regression analysis can be employed to establish regression equations for each dependent variable, measure the influence weights of independent variable against the dependent variable, and reveal the extent to which the independent variables depend on them. The theoretical hypotheses about the relationship between variables proposed in the previous section are verified by regression analysis and correlation analysis.

Based on the theoretical model constructed in this paper, the regression analysis and correlation analysis in this section are expanded in five aspects: behavioral attitude towards reducing, subjective norms, perceptual behavior control, behavioral intention, and reducing behavior.

Correlation analysis and regression analysis at behavioral attitude level

The results of the Pearson correlation test on behavioral attitudes are shown in **Table 5**. It can be seen that the correlation coefficient between behavioral attitudes and perceived usefulness is 0.552, indicating a significant positive correlation between the two variables; the correlation between behavioral attitudes

Table 5. Correlation Analysis Result of Behavioral Attitude

		Behavioral Attitude	Perceived usefulness	Perceived ease of use	Responsibility	Compatibility
Behavioral Attitude	Pearson Correlation Coefficient	1	0.552**	0.273**	0.409**	0.371**
	Significance		0.000	0.000	0.000	0.000
	N	181	181	181	181	181

Note: "**" means a significance level below 0.01

Table 6. Regression Analysis Results of Behavioral Attitude

	Unstandardized coefficient		Standardized coefficient	t	p	VIF	R^2	Adjusted R^2	F
	B	standard error	Beta						
Constant	-0.750	0.360		-1.234	0.032		0.637	0.627	46.284**
Perceived usefulness	0.607	0.120	0.298	5.071	0.000	1.670			
Perceived ease of use	0.178	0.021	0.276	4.708	0.000	1.060			
Sense of Responsibility	0.176	0.054	0.247	2.327	0.000	1.483			
Compatibility	0.232	0.056	0.148	1.724	0.004	1.564			

Note: "**" means significance level below 0.01

and perceived ease of use is 0.273, with significant positive correlation; the correlation coefficient between behavioral attitude and personal responsibility is 0.409, with significant positive correlation; the correlation coefficient between behavioral attitude and compatibility is 0.371, with significant positive correlation. The correlation relationship accords with the theoretical hypothesis, so the H1-H4 hypotheses have preliminary support.

The regression analysis results of behavioral attitude are shown in **Table 6**. It can be seen that the adjusted determination coefficient R^2 is 0.627, which is greater than 0.4, indicating good overall fitting of the behavioral attitude regression model. At the same time, for the statistic F=46.284 in the regression model, P<0.05, so the model passes the significance level test, indicating that at least one of the four independent variables can exert a significant influence on the dependent variable, and the fitting equation is meaningful. All the regression coefficients of the four independent variables satisfy T test with significance level at 0.05, indicating significance of the regression coefficients, suggesting that the four independent variables such as perceived usefulness can have a significant impact on construction workers' behavioral attitude in reducing. VIFs are all less than 5, indicating that the respective variables have passed the collinearity diagnosis, and there exists no collinear problem between the independent variables.

Table 7. Subjective Norm Correlation Analysis Results

		Subjective norm	External influence	Interpersonal influence
Subjective norm	Pearson correlation coefficient	1	0.480**	0.493**
	Significance		0.000	0.000
	N	181	181	181

Note: "**" indicates significance level below 0.01

At the same time, value of the constant P is less than 0.05, which satisfies the T test with significance level at 0.05, indicating significant difference between the constant and 0. Construction of regression equation using non-standardized coefficients yields the regression equation of behavioral attitude in this study:

$$\begin{aligned} &Behavioral\ attitude \\ &= 0.178 \times perceived\ ease\ of\ use \\ &+ 0.607 \times perceived\ usefulness \\ &+ 0.176 \times sense\ of\ responsibility \\ &+ 0.232 \times compatibility - 0.750 \end{aligned} \quad (1)$$

In summary, perceived usefulness, perceived ease of use, sense of responsibility and compatibility have a positive impacts on construction worker's attitude towards reducing behavior, validating the hypotheses H1-H4.

Correlation analysis and regression analysis at the subjective norm level

The Pearson correlation test results of subjective norms are shown in **Table 7**. The correlation coefficient between subjective norms and external influences is 0.480, indicating significant positive correlation between the two variables; the correlation coefficient between subjective norms and interpersonal influence is 0.493, with significant positive correlation. The correlation relationship accords with the theoretical hypothesis, so hypotheses H5 and H6 are preliminarily supported.

Subjective norm regression analysis results are shown in **Table 8**. It can be seen that the adjusted determination coefficient R^2 is 0.436, which is greater than 0.4, indicating good overall fitting of the subjective norm regression model. At the same time, for the statistic F=68.736 in the regression model, P<0.05, so the model passes significance level test, indicating that at least one of the two independent variables can have a significant influence on the dependent variable and the fitting equation is significant. The regression coefficients of the two independent variables satisfy T-test with significance level at 0.05, and the regression coefficients are significant, indicating that the two independent variables such as external influence can exert a significant impact on subjective norm factors of construction personnel in reducing. VIFs are all less than 5, indicating that the respective variables have

Table 8. Subjective Normative Regression Analysis Results

	Unstandardized coefficient		standardized coefficient	t	p	VIF	R^2	adjusted R^2	F
	B	standard error	Beta						
Constant	1.078	0.273		5.437	0.000		0.452	0.436	68.736**
External influence	0.297	0.035	0.518	7.857	0.000	1.060			
Interpersonal influence	0.243	0.046	0.405	6.854	0.000	1.060			

Note: "**" indicates significance level below 0.01

Table 9. Correlation analysis results of perceptual behavior control

		Perceptual behavior control	self-efficacy	Facility condition	Financial incentive
Perceptual behavior control	Pearson correlation coefficient	1	0.356**	0.498**	0.584**
	Significance		0.000	0.000	0.000
	N	181	181	181	181

Note: "**" indicates significance level below 0.01

passed collinearity diagnosis and there is no collinearity problem between the independent variables.

Meanwhile, P value of the constant is less than 0.05, which satisfies the T test with a significance level at 0.05, indicating significant difference between the constant and 0. Construction of regression equation using non-standardized coefficients yields the regression equation of subjective norms in this study:

$$\begin{aligned} &Subjective\ norm \\ &= 0.297 \times external\ influence \\ &+ 0.243 \times interpersonal\ influence + 1.078 \end{aligned} \quad (2)$$

In summary, external influence and interpersonal relationship exert a positive impacts on subjective norms of construction workers' willingness in construction reducing, verifying the hypotheses H5 and H6.

Correlation analysis and regression analysis at perceived behavior control level

The Pearson correlation test results of perceptual behavior control are shown in **Table 9**. The correlation coefficient between perceptual behavior control and self-efficacy is 0.356, indicating significant positive correlation between the two variables; the correlation coefficient between perceptual behavior control and facilitation conditions is 0.498, with significant positive correlation; the correlation coefficient between perceptual behavior control and financial incentive is 0.584, with significant positive correlation. The correlation relationship accords with the theoretical hypotheses, so the H7-H9 hypotheses are initially supported.

Table 10. Regression Analysis Results of Perceptual Behavior Control

	Unstandardized coefficient		standardized coefficient	t	p	VIF	R^2	Adjusted R^2	F
	B	standard error	Beta						
Constant	0.374	0.186		0.480	0.235		0.467	0.453	52.865**
Self-efficacy	0.314	0.035	0.243	5.423	0.000	1.306			
Facility condition	0.382	0.054	0.247	4.758	0.000	1.052			
Financial incentive	0.438	0.038	0.527	6.823	0.000	1.438			

Note: "**" indicates significance level below 0.01

The regression analysis results of perceptual behavior attitudes are shown in **Table 10**. It can be seen that adjusted determination coefficient R^2 is 0.453, which is greater than 0.4, indicating good overall fitting of the perceptual behavior control regression model. Meanwhile, for statistic F=52.865 in the regression model, P<0.05, so the model passes significance level test, indicating that at least one of the three independent variables can have a significant influence on the dependent variable, and the fitting equation is significant. All the regression coefficients of the three independent variables satisfy T-test with significance level at 0.05, and the regression coefficients are significant, indicating that three independent variables such as self-efficacy can exert a significant effect on perceptual behavior control of construction workers in reducing willingness. VIFs are all less than 5, indicating that the independent variables have passed the collinearity diagnosis and there is no collinearity problem between the independent variables.

At the same time, value of the constant P is less than 0.05, which does not satisfy the T test with significance level at 0.05, indicating no significant difference between the constant and 0. Construction of regression equation using standardized coefficients yields the regression equation of perceptual behavior control in this study:

$$\begin{aligned} &Perceptual\ behavior\ control \\ &= 0.247 \times facility\ condition \\ &+ 0.243 \times self-efficacy \\ &+ 0.527 \times financial\ incentive + \mu \end{aligned} \quad (3)$$

In summary, self-efficacy, facility condition and financial incentives exert a positive impact on construction workers' perceptual behavioral control in reducing willingness, which verifies the hypotheses H7-H9. The ranking by the degree of exerted influence from deep to less is: financial incentive, facility condition and self-efficacy.

Table 11. Behavioral Intention Correlation Analysis Results

		Behavioral intention	Behavioral attitude	Subjective norm	Perceptual behavior control
Behavioral intention	Pearson correlation coefficient	1	0.379**	0.589**	0.097
	Significance		0.000	0.000	0.160
	N	181	181	181	181

Note: "**" indicates significance level below 0.01

Table 12. Regression analysis results of subjective norms, behavioral attitude, and perceptual behavior control

	Unstandardized coefficient		standardized coefficient	t	p	VIF	R^2	Adjusted R^2	F
	B	standard error	Beta						
Constant	1.282	0.352		4.972	0.000		0.497	0.468	72.567**
Behavioral attitude	0.294	0.056	0.356	5.326	0.000	1.095			
Subjective norms	0.507	0.058	0.657	9.657	0.000	1.076			
Perceptual behavior control	0.154	0.042	0.068	2.079	0.285	1.013			

Note: "**" indicates significance level below 0.01

Correlation analysis and regression analysis at behavioral intention level

The Pearson correlation test results of behavioral intention are shown in **Table 11**. The correlation coefficient between behavioral intention and behavioral attitude is 0.379, indicating significant positive correlation between the two variables; the correlation coefficient between behavioral intention and subjective norms is 0.589, with significant positive correlation; there is no particularly obvious correlation between behavioral intention and perceptual behavior control. The correlation relationship roughly conforms to the theoretical hypotheses, with hypotheses H10 and H11 preliminary supported and hypothesis H12 rejected.

Regression analysis with subjective norms, behavioral attitude, and perceptual behavior control as independent variables, with behavioral intention as dependent variable derives the data analysis results in **Table 12**. It can be seen that the regression coefficient of perceptual behavior control does not satisfy the T-test with significance level at 0.05. The regression coefficient has no meaning, which indicates that perceptual behavior control does not have a significant impact on construction personnel's behavioral intention in reducing. This is consistent with the correlation analysis results. Therefore, perceptual behavior control factor is excluded at behavioral intention level for second regression analysis.

The regression analysis results at behavioral intention level after removing perceptual behavior control factor are shown in **Table 13**. It can be seen that

Table 13. Behavioral Intention Regression Analysis Results

	Unstandardized coefficient		standardized coefficient	t	p	VIF	R^2	Adjusted R^2	F
	B	standard error	Beta						
Constant	1.673	0.341		6.368	0.000		0.476	0.468	76.324**
Behavioral attitude	0.217	0.062	0.375	5.270	0.000	1.086			
Subjective norm	0.538	0.067	0.752	9.834	0.000	1.086			

Note: "**" indicates significance level below 0.01

the adjusted determination coefficient R^2 is 0.468, which is greater than 0.4, indicating good overall fitting of behavioral intention regression model. Meanwhile, for statistic F=76.324 in the regression model, P<0.05, so the model passes the significance level test, indicating that at least one of the two independent variables can exert a significant influence on the dependent variable, and the fitting equation is meaningful. All the regression coefficients of the two independent variables satisfy the T test with a significance level at 0.05, the regression coefficients are meaningful, indicating that both the subjective norms and behavioral attitude have significant effects on construction workers' behavioral intention in reducing. VIFs are all less than 5, indicating that the independent variables have passed the collinearity diagnosis, with no collinearity problem in between.

At the same time, value of the constant P is less than 0.05, which satisfies the T test with significance level at 0.05, indicating significant difference between the constant and 0. Construction of regression equation using non-standardized coefficients yields the regression equation of behavioral intention in this study:

$$\begin{aligned} &\mathit{Behavioral\ intention} \\ &= 0.217 \times \mathit{behavioral\ attitude} \\ &+ 0.538 \times \mathit{subjective\ norms} + 1.673 \end{aligned} \quad (4)$$

In summary, both subjective norms and behavioral attitude have a positive impacts on construction workers' behavioral intention in reducing, verifying the hypotheses H10 and H11 in this study. Subjective norm exerts greater influence on behavioral intention of reducing compared with behavioral attitude, but there is no significant relation between construction workers' behavioral intention and perceptual behavior control, So that the hypothesis H12 has been rejected.

Correlation analysis and regression analysis at the behavioral level

The behavioral Pearson correlation test results are shown in **Table 14**. The correlation coefficient between behavior and behavioral awareness is 0.207, indicating a significant positive correlation between the

Table 14. Behavioral Correlation Analysis Result

		behavior	behavioral intention	perceptual behavior control
behavior	Pearson correlation coefficient	1	0.207**	0.576**
	Significance		0.005	0.000
	N	181	181	181

Note: "**" indicates significance level below 0.01

Table 15. Behavioral Level Regression Analysis Results

	Unstandardized coefficient		standardized coefficient	t	p	VIF	R^2	Adjusted R^2	F
	B		Beta						
Constant	-0.325	0.567		-0.592	0.762		0.357	0.351	39.346**
Perceptual Behavior Control	0.638	0.062	0.637	7.627	0.000	1.035			
Behavioral intention	0.357	0.138	0.283	3.482	0.031	1.035			

Note: "**" indicates significance level below 0.01

two variables; the correlation coefficient between behavior and perceptual behavioral control is 0.576, with significantly positive relationship. The correlation relationship meets the theoretical hypotheses and initially supports the hypothesis H13 and H14.

The behavior regression analysis results are shown in **Table 15**. It can be seen that the adjusted determination coefficient R^2 is 0.351, indicating small overall fitting of behavior regression model. It is possible that other factors affecting construction reducing behavior are not considered. Meanwhile, for statistic F=39.346 in the regression model, P<0.05, so the model passes the significance level test, indicating that at least one of the two independent variables can exert a significant influence on the dependent variable, and the fitting equation is meaningful. All the regression coefficients of the two independent variables satisfy the T test with a significance level at 0.05, the regression coefficients are meaningful, indicating that both behavioral intention and perceptual behavior control have significant effects on construction workers' reducing behavior. VIFs are all less than 5, indicating that the independent variables have passed the collinearity diagnosis, with no collinearity problem in between.

At the same time, value of the constant P is greater than 0.05, which satisfies the T test with significance level at 0.05, indicating no significant difference between the constant and 0. Construction of regression equation using standardized coefficients yields the regression equation of behavior in this study:

$$\begin{aligned} &Behavior \\ &= 0.637 \times Perceived\ Behavioral\ Control \\ &+ 0.283 \times Behavioral\ Intention + \mu \end{aligned} \quad (5)$$

In summary, the perceptual behavior control and behavioral intention have a positive impact on construction workers' reducing behavior, verifying the hypotheses H13, H14.

RESULTS

Through the empirical test of the established theoretical model in the previous section, this study derives 13 factors such as perceived usefulness that affect construction workers' willingness in reducing behavior.

1. At the behavioral level, reducing behavioral willingness and perceptual behavioral control directly influence reducing behavior. Perceived behavioral control has a more significant impact.
2. At the behavioral intention level, reducing behavioral attitude and subjective norms of construction workers exert significant impact on reducing behavioral intention and indirectly affect reducing behavior. Construction workers' subjective norms have a greater influence.
3. At the level of perceptual behavior control, reducing facility condition, self-efficacy, and financial incentives exert a significant impact on construction workers' perceptual behavior control in reducing, and indirectly affect reducing behavior, with financial incentive exerting the greatest influence and self-efficacy the smallest.
4. At the level of behavioral attitude, construction workers' compatibility, perceived ease of use, perceived usefulness and personal responsibility directly influence reducing behavioral attitude, and indirectly affect the implementation of reducing behavior. Perceived usefulness exerts the most significant influence, followed by compatibility, while perceived ease of use and personal responsibility exert equal influence.
5. At the subjective norm level, construction workers' subjective norms in reducing is directly influenced by external and interpersonal aspects, in which, external influence exerts more significant influence on subjective norms in reducing.

In summary, the research hypotheses H1-H14 are verified except H12 "perceptual behavior control will affect behavioral intention in reducing". After deleting the influencing factors involved in hypothesis H12, the model of influencing factors in reducing willingness are obtained as shown in **Table 16**.

Table 16. Test Results of Research Hypotheses on Influencing Factors in Construction Workers' Reducing Willingness

Hypothesis	Statement	Result
H1	Construction workers' perception of perceived usefulness in willingness to reduce construction waste has a positive impact on attitudes towards reducing willingness	Verified
H2	Construction workers' perception of perceived ease of use in willingness to reduce construction waste has a positive impact on attitudes towards reducing willingness	Verified
H3	Construction workers' compatibility in willingness to reduce construction waste has a positive effect on reducing willingness.	Verified
H4	construction workers' sense of responsibility in willingness to reduce construction waste will positively affect attitudes to reducing willingness	Verified
H5	The external influences perceived by construction workers have a positive effect on the subjective norms in reducing willingness	Verified
H6	Construction workers' perceived interpersonal influence has a positive impact on subjective norms in reducing willingness	Verified
H7	onstruction workers' perception of self-efficacy in waste reducing willingness has a positive impact on perceptual behavioral control of reducing willingness	Verified
H8	construction workers' facility condition in construction waste reducing willingness has a positive effect on perceptual behavioral control.	Verified
H9	Financial incentives in construction workers' construction waste reducing willingness has a positive effect on perceptual behavioral control of reducing willingness	Verified
H10	Construction workers' behavioral attitudes to construction waste reducing willingness has a positive impact on behavioral intention in reducing	Verified
H11	construction workers' perception of subjective norms in construction waste reducing willingness has a positive effect on behavioral intention in reducing	Verified
H12	construction workers' perception of perceptual behavioral control in construction waste reducing willingness has a positive impact on behavioral intention in reducing	Rejected
H13	construction workers' perception of perceptual behavioral control in construction waste reducing willingness has a positive impact on the occurrence of reducing behavior	Verified
H14	Construction workers' behavioral intention in construction waste reducing has a positive impact on the occurrence of reducing behavior	Verified

CONCLUSION

In this study based on the theory of planned behavior, a theoretical analysis model is built with construction workers of Pearl Delta River as the subjects based on relevant literature on the influencing factors in reducing willingness, to study influencing factors in construction workers' waste reducing willingness using data statistical analysis SPSS22.0 software.

(1) Both behavioral intention and perceptual behavior control positively influence construction workers' reducing behavior, but perceptual behavior control exerts more significant influence. It was found in interviews with workers that, most construction workers have a strong sense of reducing, but rarely implement waste reducing behavior in practice. In-depth analysis found that although construction workers have sense of reducing, also with confidence in their own abilities and skills, they are mostly junior high school graduates and below, with weak control capabilities in case of external obstacles such as inadequate construction equipment, tight schedule, small operation space, which makes construction workers rarely implement waste reducing practices. The theory of planned behavior points out that under circumstances impossible to be completely controlled via individual will, individual behavior is not only affected by behavioral intention, but also by perceptual behavior control such as resources, opportunities and personal abilities. More even, behavior occurrence is directly triggered by perceptual behavior control. Therefore, it is recommended to provide specialized training on construction waste reducing techniques and to give construction workers with sufficient space, tools, equipment and time, so that construction workers' perceptual behavior control ability is enhanced and construction workers' participation in reducing behavior is increased.

(2) Subjective norms and behavioral attitude positively impact construction workers' behavioral intention in reducing behavior, and subjective norms exert more significant influence. It is found in interviews with construction workers that, they can generally feel the pressure from fellow workers, leaders and owners, especially leaders. It is also found that a construction worker team may be fellow-townsmen similar in age and cognition level, and everyone's ideas influence each other. However, perceptual behavior control has no significant effect on reducing behavioral willingness. The reason is that construction workers are more likely to yield to the control of will and rationality when assessing their reducing behavioral intention. For instance, economic interests will become a strong motivation, so perceptual behavior control has no significant effect on behavior intention, which is consistent with research conclusions of Li et al. (2015).

(3) Financial incentives, self-efficacy, and facility conditions positively affect construction workers' perceptual behavior control ability. Where, financial incentive factor exerts the most significant impact. The survey found that post-1990s generation accounted for a large part of the construction workers who generally have self-awareness, and cannot match the skilled workers with longer length of service in terms of regulation compliance and command following. Therefore, instead of following the company's directions of cost savings and construction reducing, they are more inclined to satisfy individual interests first. Workers between the ages of 25 and 45 are basically the pillars in family economy, so economic factors will be a decisive factor affecting their willingness orientation. Construction workers will generally make opportunity and resource analysis before choosing whether to adopt reducing measures when things are completely controlled by the will. It is because adoption

of reducing measures will take up extra working hours and affect work efficiency, which is directly linked to their individual performance. It is recommended that companies should provide financial incentives, offer reducing techniques and methods for learning, and encourage construction workers to actively consider reducing from multi-perspectives, so that construction workers improve confidence in construction reducing implementation, thereby willing to take reducing actions.

(4) Personal responsibility, perceived usefulness, compatibility, and perceived ease of use positively impact reducing behavioral attitude, and perceived usefulness exerts more significant effect on reducing behavioral attitude. Investigation and analysis reveal that construction workers can basically sense that reducing measures can bring benefits and reduce construction costs. They also contend that mutual help between colleagues and solidarity among the construction team make it easier for them to perceive that reducing is easy to learn and operate. The popularity of value concept of environmental protection, energy conservation and emission reduction advocated by the society makes them perceive their responsibility in implementing construction reducing behavior. Therefore, the following methods can be taken to enhance construction workers' awareness of reducing: popularize reducing concept among construction workers through network propaganda and education, so that environmental protection concept of green waste reduction gain wider popularity. Meanwhile, construction workers' social responsibility for waste reduction should be prescribed in laws and regulations to clarify responsibilities in reducing and enhance construction workers' cognition towards responsibility of reducing.

(5) Interpersonal and external influences positively impact construction workers' perception of subjective norms in reducing which derives from social and cultural environment such as mass media, public opinion, legal norms, leaders, colleagues and owners. Interviews with on-site construction workers found that they work from six o'clock every day until about 5:30 in the afternoon, with two hours' rest at noon. At night, they mostly browse news or watch TV shows on mobile phones. Owing to their low education in general, limited cognition level, and constraint in the scope of life and work activities, their concept is more influenced by the surrounding people and the information exposed to them on mobile media. It is recommended that construction reducing environment should be created among the whole society, relevant laws and regulations should be improved to institutionally encourage construction waste reducing. Also, strengthen the supervision of reducing actions, implement reducing action, and advise each other to take reducing measures among colleagues.

Based on source reduction, this paper investigates influencing factors in construction workers' willingness to reduce construction waste through analysis of human behaviors and attitudes. However, the research subject of this paper is limited to construction workers and study is not made on construction reducing willingness of construction site managers, such as project managers, construction managers, construction technicians, etc. In the future, theoretical models such as norm activation theory model, cost-benefit model, environmental economics theory, and structural equation model can be further employed to study project managers, construction management personnel and construction technicians so that study on construction waste reducing willingness is more comprehensive, thus providing targeted construction reducing management opinions and suggestions for managers of different construction sites. Secondly, with the development of science and technology, as well as the application of artificial intelligence in construction sites, how to change construction workers' reducing awareness is also what we need to study in the future.

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