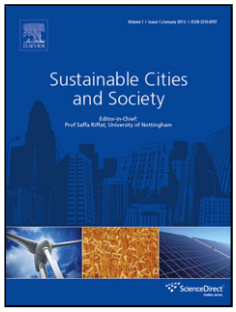

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Psychological and Conditional Factors Influencing Staff's Takeaway Waste Separation Intention: an Application of the Extended Theory of Planned Behavior

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High lights:

- "Office building besieged by O2O take-away waste" becomes a new serious problem in Chinese metropolis.

- The psychological factors included environmental concern, environmental attitude, subjective norm and perceived behavioral control, and the conditional factors include convenience (facilities) and time pressure.

- We used Mplus to analyze the determinants of separation intention of takeaway waste at workplace, and found that all the psychological and conditional constructs except subjective norm influence the intention significantly.

- We analyzed the mediating effects of TPB constructs over the relationship between environmental concern and separation Intention, and found that there are partial mediating effects.

- The analyses revealed that facilities and time pressure are the most influencing conditional factors in predicting separation intention of take-away waste in the workplace.

Abstract: With the increasing application of online to offline food delivery service, “Office building besieged by online-to-offline takeaway waste” becomes new and serious problems to the sustainability of Chinese cities. This paper examined the determinants of waste separation intention of takeaway waste among 487 urban residents by using the extended theory of planned behavior. Three additional factors were added into the Theory of Planned Behavior model: environmental concern, facilities and time pressure. The empirical results indicated that the attitude, perceived behavioral control,

facilities was significantly and positively related to the waste separation intention. While the relationship between time pressure and intention was significantly negative. And the attitude, subjective norm and perceived behavioral control towards separation of food takeaway waste partially mediated the effects of consumers' environmental concern on the intention. The result also supported the applicability of including additional constructs in theory of planned behavior, as it had improved the predictive utility of the proposed model. At the end, implications for concerned stakeholders and scope for further research had been discussed.

Key words: Environmental concern; extended theory of planned behavior; facilities; separation intention of take-away waste; time pressure

1. Introduction

With the expansion of urbanization and speedy of work pace, more and more people eat outside home (Seto and Ramankutty, 2016). People working in the office buildings do not have enough time to go back home for lunch. For most small- and minor- sized companies, workplace canteens are not provided due to the constraints of cost and space. In the past, people may walk out to the restaurants and snack bars nearby for lunch, and there is no food waste generated in workplace. With the development and prevalence of online-to-offline (O2O) food delivery service, more and more people order food takeaways via Application Procedures (APPs) and have their lunch in workplaces. O2O food take-away, also named ***Waimai (外卖)*** in Chinese, refers to food delivery service from online to offline[1]. The O2O food take-away service become very popular in China since it can better facilitate the customers. It is reported that O2O food delivery Gross Merchandise Volume (GMV) market reached 44,240 million Chinese Yuan in 2016 and 53.3% of O2O food delivery orders occurs at work/in class (iResearch, 2016). The growing demand for food take-away in workplaces has resulted in a sharp increase of solid waste in office buildings due to the disposal of leftovers and tableware packages (Goggins and Rau, 2016). According to

1 In O2O food delivery, it performs like: the consumers place orders online or via mobile Apps, then the catering businesses prepare the meal, the courier send the meal to the office in stipulated time.

People.cn[2], there are more than 20 million food takeaway orders handled by the top 3 O2O platforms (Meituan, ele.me and Baidu Food Delivery) each day, producing 60 million pieces of disposable tableware, plastic bags and large quantities of leftovers. While in most cases, the food leftovers and the disposable tableware are thrown away without separation, which increase the difficulty and cost in further treatment in landfill and incineration. "Office building besieged by O2O food take-away waste" has become a new environmental problem in cities and office buildings, and got the attention from the Chinese government, environmentalists and people (Y Pan, 2017).

Reducing food leftovers and making appropriate separation of take-away waste is the main channel to solve this problem. Previous studies always relate waste management in workplace to household waste management (Greaves et al., 2013; Manika et al., 2013; Paillé and Boiral, 2013). But reduction of food leftovers and separation of take-away wastes in workplace are quite different and more difficult than household waste. Firstly, the portion of food leftovers over ordered in take-away is much more than that of household, because there is no refrigerators in workplace. Secondly, there is less disposable tableware and packaging bags used at home since household tableware are mainly made from reusable ceramics and stainless steels. While in the case of food take-away in workplace, tableware is almost

2 People.cn, is a website, owned and operated by the Renmin Daily, an important official media agency in China.

entirely made from plastics, sometimes even from foamed plastics. And treatment of plastic waste may induce serious environmental problems, such as carbon emission by burning, land occupied in landfilling and long years required for decomposing (Braun and Traore, 2015). Thirdly, it is time-consuming to separate food and plastic waste in the context of public places, because the take-away waste is a mixed type, which would make separation more time-consuming. Lastly, people' environmental responsibility for public affairs may be different from those for household issues (Greaves et al., 2013). There may be less responsibility for the hygiene, cleanness of the public workplaces compared to household.

There had been considerable researches on the determinants of separation of food leftovers and other solid waste. Attitudes, social norms and choice design were the most studied topics in Previous studies in out-of-home consumption situations (Lusk and Briggeman, 2009; Cruwys et al., 2015; Lorenz et al., 2017). While most of the studies focused on the settings of households, public caterings and schools (Lorenz et al., 2017; Russell et al., 2017). To the best of our knowledge, there had been little research on compulsory separation intention of take-away waste in workplace. Regulation supervision over this issue was scarce in China, and all the participants in O2O take-away service, the government, O2O platforms, property management companies and the consumers, felt it urgent to solve the problem (Y. Pan, 2017). Therefore, we choose to understand individuals'

psychological and situational consideration towards separation of take-away waste in workplaces.

2. Literature review and hypotheses development

To provide a theoretical basis to analyze the personal psychological and situational factors in separation intention of take-away waste in workplaces, we considered studies on food related behaviors in dining out settings and solid waste separation behaviors in households' settings.

2.1 Theory of Planned Behavior

Both Theory of Planned Behavior (TPB) and Social cognitive theory (SCT) are popular and regarded as effective models to analyze individuals' behavioral decisions from the perspective of personal, environmental and behavioral factors (Lee, 2014). TPB provides a theoretical framework for examining pro-environmental behaviors systematically. According to the theory, an individual's behavior was determined by the persons' readiness to perform the behavior (*i.e.,* intention), where intention itself was influenced by attitude, perceived behavior control and subjective norm (Ajzen, 1991; Ajzen, 2002). TPB had been widely used in researches in different domains，several studies had made fruitful contributes in case of individuals' perception on separation of food leftovers and solid waste (Karim Ghani et al., 2013; Tonglet et al., 2004a; Tonglet et al., 2004b). Another model that is

widely used to predict behavior is Bandura's Social Cognitive Theory (SCT) (Bandura, 1977). This model emphasizes the self-efficacy and outcome expectancy in behavioral intentions (Baker-Eveleth and Stone, 2008; Cheng and Chu, 2014). And it is also widely used in sport science, vocational behavior, media, academic as well as organizational management (Ring and Kavussanu, 2018; Wood and Bandura, 1989; Cheng and Chu, 2014). There are lots of researches making comparative analyses between TPB and SCT, and the results appeared contradictive. Some shows that SCT model is more powerful in analyzing behavioral intentions than is the TPB model (Broadhead-Fearn and White, 2006; Terry and O'Leary, 1995), while others certifies that TPB model is more effective than is the SCT model (Lin and Chiou, 2010; Cheng and Chu, 2014). These results suggest that the relative strength of the predictive utility of the two models may be domain-specific. To the best of our knowledge, SCT is less used in pro-environmental behavior studies. Hence we employ TPB with inclusive conditional factors to analyze the determinants of the residents' separation intention of take-away waste in workplaces.

Attitude here referred to the degree to which a person had a favorable or unfavorable perception toward a particular behavior (Ajzen, 1991). Attitude was reported to be the strongest predictor in recycling and food waste separation intention (Karim Ghani et al., 2013; Tonglet et al., 2004a; Tonglet et al., 2004b). In this research, attitude toward separation of take-away waste

was a psychological evaluation that stemmed from individuals' perception. If individuals had active attitude towards the separation of food and plastic wastes, they would form the intention to separate the take-away waste. Therefore, this paper expected that consumers' separation intention of takeaway wastes would possibly be influenced by their inside attitude (Ajzen, 1991; Yazdanpanah and Forouzani, 2015).

Subjective norm was individuals' perception of pressure recognized from important people that he should or should not perform a behavior (Ajzen, 1991). Various studies had confirmed that subjective norm was a major factor of behavior in household solid waste and waste separation settings (Karim Ghani et al., 2013; Ramayah et al., 2012). Here we followed the original hypothesis of TPB to presume that subjective norm was an important motivation for separation intention of take-away waste, because in the context of China, the prevailing collectivist culture meant that people were strongly influenced by significant others (Furnham et al., 2012).

Perceived behavioral control (PBC) was defined as "individuals' expectation regarding the degree to which they are competent in performing a given behavior" (Ajzen, 2002). It was concerning the self-perceived ease or difficulty of doing a certain behavior (Ajzen, 1991). Results of PBC over intention and behavior varied in different studies, reflecting different context. In the studies of waste separation, PBC had been reported to be either positive (Knussen et al., 2004) or to be insignificant (Ramayah et al., 2012;

Karim Ghani et al., 2013). In this study, we followed the original hypothesis of TPB model, and supposed that if consumers were provided with necessary conditions, they would choose to separate takeaway waste in workplace. Hence, we put forward with the following hypotheses:

H1a: Attitude positively influences consumers' separation intention of takeaway waste in workplace.

H1b: Subjective norm positively influences consumers' separation intention of takeaway waste in workplace

H1c: Perceived behavior control positively influences consumers' separation intention of takeaway waste in workplace

2.2 The extended TPB

Although TPB was widely used in the research of pro-environmental behaviors, it had been criticized for insufficiency in capturing moral influences on behavior since moral or normative issues are important predictors of behavior (Armitage and Conner, 2001a; Sparks and Shepherd, 2002). And other conditional factors should be added into TPB to broaden the scope of use and improve predictive power in different context (Ajzen, 1991; Armitage and Conner, 2001b; Donald et al., 2014). Here we included one moral construct, environmental concern, and two additional constructs, facilities and time pressure, into TPB model to assess individuals' willingness to separate take-away waste, and the concerning reasons were

included in the literature reviews respectively.

2.2.1 Environment concern and TPB constructs

Environmental concern referred to general perception toward environment protection (Crosby et al., 1981). The value basis theory (Stern and Dietz, 1994) provided that attitude about environmental issues were based on the more generally underlying values. Environmental concern was certified as a key basis in environmental management researches (Hines et al., 1987; Diamantopoulos et al., 2003). Individuals with high level of environmental concern were prone to perform pro-environmental behaviors. However, environmental concern influences behavior indirectly. Ordinarily, attitude in TPB was always defined in the context of a specific behavior, and it worked well when the attitudinal and behavioral measures fit each other. So, consumers' general belief of environmental protection was predicted to have indirect influence on intention via three constructs in the original form of TPB model (Ajzen and Fishbein, 1980). Reviews of previous empirical studies confirmed that the coefficients of environmental concern and behavior displayed a low to moderate level ranging from 0.26 to 0.35 (Eckes and Six, 1994; Fuhrer, 1995), which supported the suggestion of (Ajzen and Fishbein, 1980;. Bamberg, 2003) also confirmed that environmental concern influenced behavioral intention via mediating effects of norms, beliefs. In the context of our study, we assume that the TPB constructs are influenced by

the environmental concern positively. Hence, we hypothesized as:

H2a: Environmental concern positively influences consumers' attitude toward separation of takeaway waste in workplace.

H2b: Environmental concern positively influences the subjective norm.

H2c: Environmental concern positively influences consumers' perceived behavioral control toward separation of takeaway waste in workplace.

2.2.2 Time pressure, facilities and intention

Though TPB was widely used in researches, it had been suggested and confirmed that adding situational factors into TPB model could improve its predictive power (Davis et al., 2006; Armitage and Conner, 2001b; Donald et al., 2014). Previous studies in eating and waste separation behavior had indicated that conditional factors are significant elements in predicting the intention and behavior. Among these factors, facilities and time pressure provided causal reasons for these behaviors (Xu et al., 2017; Lorenz et al., 2017). In early studies using TPB, time and facilities were always measured as components of the PBC. And PBC is measured either by generally perceptional control, or by specific issues such as perceived availability of facilities and time. A large amount of researches on marketing and pro-environmental behavior explored the effects of contextual influences over behavior, including facilities and time (Nordqvist et al., 2004; Lorenz et al., 2017). In these studies, time pressure and facilities were disengaged from

PBC to show its dominant influence. Lorenz et al. (2017) disengaged time pressure from PBC and got a result showing that an expanded time for a meal could induce more food intake and less plate remnant. Tonglet et al. (2004b) and Wan et al. (2012) analyzed the effect of time over recycling behavior by asking the respondent whether separation was time consuming. All the studies had shown that an extended time was related to lower plate leftovers and higher recycling intention. Since the major purpose of this paper is to analyze the effects of contextual factors over separation intention, time pressure and facilities were disengaged from PBC and effects were tested. Considering the context of separation intention of takeaway waste in workplace, time was quite tight for the whole procedure. During this period, individuals should place online order, waited for the food, finished food, and then handled with the leftovers and waste. To separate the takeaway waste, individuals should dump the leftovers into a food waste bin first, and then separate the recyclables from the unrecoverable. So, separation of the take-away waste costed much more time, which made lunch time tighter. Based on the analysis above, we proposed the following hypothesis:

H3: Time pressure negatively influences consumers' separation intention toward takeaway waste in workplace.

Accessibility was a key determinant of citizens' involvement in waste separation. Municipalities were obliged to provide necessary facilities for waste collection and treatment so that individuals could separate and throw

waste into different bins. Provision of sufficient facilities was a vital determinant in the efficiency of waste management in municipals (Davis et al., 2006; Tonglet et al., 2004a). High satisfaction with local facilities would strengthen the residents' positive intention towards separation (Tonglet et al., 2004b), while perceived lack of facilities would be barriers (Karim Ghani et al., 2013; Latif et al., 2012; Ramayah et al., 2012; Tonglet et al., 2004b). In the context of takeaway waste separation, better facilities provided would facilitate and encourage individuals to engage in separation voluntarily. Based on the analyses above, we proposed the hypothesis H4:

H4: Perceived satisfaction of facilities influences consumers' separation intention toward takeaway waste in workplace.

The framework and hypotheses of this study were illustrated in Fig. 1.

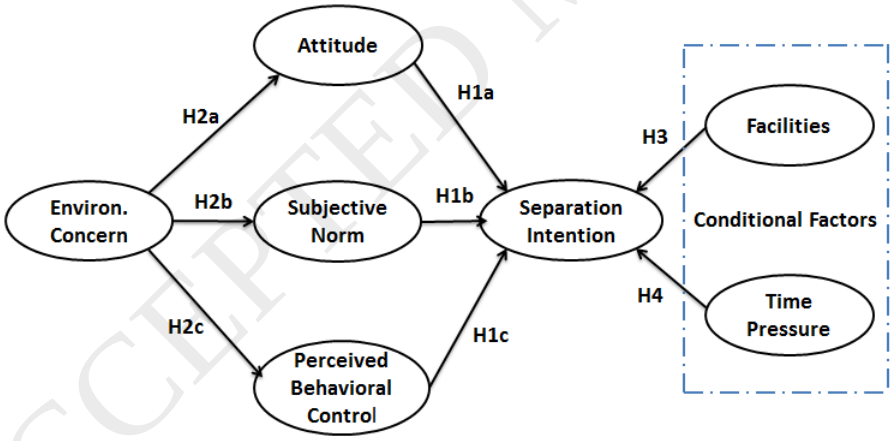

Fig.1. Research framework and hypotheses of residents' intention to separate takeaway waste

3 Data and methodology

3.1 Study setting

The present study was conducted in the office buildings in Chengdu Hi-tech Industrial Development Zone (CHIDZ). The CHIDZ was located in the center of Chengdu, the capital of Sichuan province. It was setup in 1988 and was approved as the first batch of National High technology Zone in 1991. As the end of 2016, CHIDZ ranked the 3rd among 115 National High-tech Zones[3]. The CHIDZ has a terrestrial area of 613 square kilometers. There are 83.4 thousand companies, including 29 listed companies, 830 registered High-tech enterprises and 12.7 thousand incubated enterprises in CHIDZ. Among these companies, most of them are minor and small-sized start-ups. For theses start-ups, financial constraints and space limitation prevent them from providing the staff with workplace canteens. So most of the staff order take-away via O2O platforms and have their lunch in workplaces.

3.2 Questionnaire design

The questionnaire was formulated on the research framework and hypotheses mentioned above. There were two parts in the questionnaire, one including general demographic questions of the respondents, and another

[3] Introduction to Chengdu Hi-tech Industrial Development Zone. Available at: http://www.cdht.gov.cn/. Accessed on 12-09-2017

focusing on the constructs and items of this study. All the items were measured by multi-item scales. The items were based on Francis' (Francis et al., 2004) general recommendations and prior researches of pro-environmental and waste management behavior (Table 1). We used 7-point Likert scale method to measure the scores of items, with 1 meaning "strongly disagree" and 7 denoting "strongly agree".

The questionnaire was drafted in English, then it was translated into Chinese by two professors, one of waste management and another of English specialty. Then the Chinese edition was reviewed and checked by two scholars again to ensure that the translation would not make confusion

3.3 Sampling procedure

A pilot study was conducted using forty questionnaires in the office buildings in CHIDZ at lunch time. The questionnaire was modified according to the feedback and recommendations. Then the modified questionnaire was discussed with two experts and made further revision. Finally, we got the final edition of a questionnaire with 20 items of 7 constructs.

Two methods were used to make the survey. Firstly, the Chinese questionnaire were posted on a popular electronic survey platform (https://www.sojump.com/), then a hyperlink and a two-dimensional code generated by the system were transferred in the QQ groups and on WeChat

circles, the most popular social media in China, among people working in CHIDZ from May 7 to July 27, 2017. Online questionnaire is regarded as less expensive, easy conducting and higher accessible for potential participants (Kraut et al., 2004). We told people our intention and asked them to fill in the questionnaires. At the same time, bonus was provided to people who finished and shared our questionnaire in other groups by providing red packets randomly generated in the *sojump* system[4]. In another way, we visited the office buildings in CHIDZ during lunch time, and distributed the questionnaires to people working there. Totally, we obtained 725 questionnaires, with 621 online and 104 offline. 238 invalid and incomplete ones were deleted, and got a sample of 487 usable responses. Furthermore, T test was used to test the non-response bias by comparing the early and late respondents. The results showed that no significant differences existed among them.

The demographic data of the respondents were provided in Table 2. Among the respondents, 56% were male. In terms of age, 48% aged between 23 and 35. 41% aged between 36 and 55. The distribution of monthly income was relatively balanced, 5% earned less than 2500 RMB, 28% ranging from 2501 to 5000 RMB, and 58% ranging from 5001 to 7500 RMB, added to

[4] In the data collection website, the poster can set random bonus for whom answering and sharing the questionnaire. We deposit RMB 2000 in the bonus system, and set the mode as "provide the first 800 respondents with randomly generated bonus ('red packs' in Chinese)", then the system will generate 800 red packs (bonus) with uneven amount. When a person finishes the questionnaire and share the link, he will get a red pack.

another 9% that was above 7501 RMB. The respondents were relatively well-educated, 69% had an associate degree or bachelor's degree, and 26% had a master's or doctor' degree. To large extent, the demographic data resembled the characteristic of level of education and monthly income in industries related to high-technology and production (Zhang et al., 2014; CBS, 2016).

Table 1 Constructs and measurement items.

Constructs	Items	Measurement items	Source
Subjective Norm(SN)	3	Most people who are important to me would think I should engage in the separation of takeaway waste in workplaces.	Francis et al. (2004)
		I feel under social pressure to separate the solid wastes (plastic bags, plastic plates and bowls, etc.) of my takeaway in workplaces.	
		My Colleague engages in the separation of takeaway waste in workplaces.	
Perceived Behavioral Control(PBC)	2	Managing takeaway wastes in workplaces is easy.	Tonglet et al.(2004b)
		I know how to separate my takeaway waste in workplace.	
Time Pressure(TP)	3	Separation of food and plastic wastes from takeaway orders in workplaces is a waste of time.	Lorenz et al. (2017)
		My lunchtime was always short.	
		I do not want to waste my lunchtime to make separation.	
Environmental Concern(EC)	3	How concerned are you about leftovers and plastic tableware thrown away as garbage?	Pagiaslis and Krontalis (2014)
		How concerned are you about the environment?	
		How concerned are you about pollution?	
Separation Intention(SI)	3	I believe that over the next three months I will engage in the separation of my takeaway waste at the workplaces.	Ioannou et al. (2013))
		Over the next three months I want to make separation of food and plastic wastes from my takeaway orders in workplaces.	
		I intend to separate my takeaway waste in workplaces on a regular basis if there are food waste collection measures.	
Environmental Attitude(ATT)	3	In my opinion, to separate my takeaway waste in workplace is a good activity.	Wan et al.(2013)
		I think that takeaway waste separation in workplace would be an interesting task	
		Takeaway waste separation in workplace should be further promoted in China.	
Facilities (FAC)	3	There are enough recycling bins in the office building.	Chen and Tung (2010)

	The activities for separate takeaway waste collection in my office building are well organized.	Stoeva & Alriksson (2017)
	There are satisfactory resources for separate takeaway waste collection provided in the office building.	Tonglet et al. (2004b)

Table 2: The demographic composition of the samples

Variable	Categories	Frequency	Percent (%)
Gender	Male	273	56.06
	Female	214	43.94
Age	Under 22	17	3.49
	23-35	235	48.25
	36-55	204	41.89
	56 and above	32	6.57
Education	Senior high school or below	22	4.52
	college or bachelor degree	335	68.79
	Master's degree or PhD	130	26.69
Monthly income(RMB)	Less than 2500	26	5.34
	2501-5000	134	27.52
	5001-7500	282	57.91
	More than 7501	45	9.24
total		487	100

4 Data analysis and results

Data analysis was conducted using SPSS 23.0 and Mplus 7.4. Kurtosis and skewness indices were used to assess the normality. The results indicated that the distributions of variables did not deviate significantly from normality, with the skewness between -0.927 to 0.23, and kurtosis between -0.868 to 1.052. The values of skewness and kurtosis were both below the accepted thresholds of 3 and 10 respectively (Kline, 2011).

Since all the data were perceptually self-reported and were got at the same time from the same source, common method bias (CMB) might threaten the effectiveness of the study (Kamakura, 2010). Harman's one-factor test was employed here, and the results indicated that all the items were classified into six components with eigenvalues higher than 1. These six components accounted for 64% of the variance. The first construct explains 16.23% of the variance, which is below the benchmark of 30% (Harman, 1976), indicating no serious CMB in this study. Furthermore, since the data were collected through online and offline ways, Mann-Whitney U test were used to analyze if there was significant difference between the data

of these two categories. The result (P=0.065) indicated that no significant difference existed in these two sets of data, hence we could combine these two sets of data as a sample to make further analysis.

4.1 Measurement model testing

The Maximum Likelihood Robust Estimator (MLR) was used to analyze the hypotheses. No data distribution assumption of multivariate normality is required in MLR analysis, and the results are robust (Byrne, 2013).

Before checking the hypotheses, the construct reliability and validity were tested. Construct reliability referred to the consistency of the indicators. Cronbach's alpha and composite reliability were used here (Fornell and Larcker, 1981). As stated in Table 3, the Cronbach's alpha value ranged from 0.709 to 0.857, conforming to the valid threshold of 0.7 (Amaro and Duarte, 2015). Composite reliability values were among 0.838 to 0.925, all higher than the suggested benchmark of 0.6 (Bagozzi and Yi, 1988). All the results confirmed good level of reliability.

Furthermore, the Convergent and discriminant validity were assessed. Convergent validity analyzes the degree to which two or more measures of constructs being related to each other. Here factors' outer loadings and the average variance extracted (AVE) were employed. Results showed that the loadings of all items were higher than the threshold of 0.7 (Joe Jr et al., 2014). AVE equals to the communality, and a threshold of 0.5 is recommended (Fornell and Larcker, 1981). Here all the AVEs were among 0.58 to 0.85 and were higher than the threshold value of 0.5.

Then discriminant validity was used to test the extent one construct was distinct from another. Here the discriminant validity was assessed and demonstrated in table 4. Assessment showed that all the factor correlations were below 0.8, and the square roots of AVEs were found higher than its correlation values, all ensuring discriminant validity (Chin et al., 1997).

Generally speaking, the proposed model represented necessary validity and reliability, and was ready for further analysis.

Table 3 Results of measurement model analysis.

Construct	Items	VIF	Loadings	Cronbach's alpha value	Composite reliability	AVE
Attitude(ATT)	ATT1	1.921	0.873	0.831	0.899	0.748
	ATT2	2.202	0.879			
	ATT3	2.096	0.873			
Perceived behavioral control(PBC)	PBC1	1.793	0.835	0.848	0.908	0.767
	PBC2	2.110	0.879			
	PBC3	1.920	0.876			
Intention(INT)	INT1	1.855	0.843	0.857	0.913	0.778
	INT2	2.402	0.897			
	INT3	2.449	0.902			
Facilities(FAC)	FAC1	2.144	0.878	0.822	0.894	0.738
	FAC2	1.709	0.837			
	FAC3	1.858	0.857			
Time pressure(TP)	TP1	1.683	0.866	0.803	0.883	0.716
	TP2	1.754	0.835			
	TP3	1.753	0.827			
Subjective norm(SN)	SN1	1.263	0.751	0.709	0.838	0.633
	SN2	1.484	0.807			
	SN3	1.541	0.827			
Environmental concern(EC)	EC1	2.084	0.933	0.838	0.925	0.860
	EC2	2.084	0.921			

Note: (1) AVE=Average Variance Extracted; (2) VIF= Variance Inflation Factor.

Table 4: Correlation between the constructs and descriptive statistics

Construct	ATT	PBC	INT	FAC	TP	SN	EC
ATT	0.86						
PBC	.671**	0.88					
INT	.728**	.641**	0.88				
FAC	.646**	.568**	.736**	0.86			

TP	-.458**	-.439**	-.640**	-.591**	0.85		
SN	.445**	.468**	.617**	.576**	-.603**	0.79	
EC	.585**	.476**	.760**	.674**	-.571**	.531**	0.93
Means	4.5058	5.3847	5.1745	4.8864	4.6318	4.7851	4.1448
SD	1.22424	1.25739	1.27974	1.29959	1.21167	1.20047	1.32485

Note: (1) The diagonal elements italicized are the square roots of AVEs; (2) **. Correlation is significant at the 0.01 level (2-tailed).

4. 2 Structural model testing

Mplus 7.4 was used to analyze the model. As indicated in table 5, the final structural model reached a good fit, with all the indices conforming to the reference values in (Bagozzi and Yi, 1988).

Table 5 General theoretical model-fit indices

Indices	Values
Chi-Square(χ^2)	322
degrees of freedom (df)	159
Chi-Square/df	2.03
Comparative Fit Index (CFI)	0.927
Tucker Lewis Index (TLI)	0.912
Root Mean Square Error of Approximation (RMSEA)	0.064
Standardized Root Mean Square Residual (SRMR)	0.055

As shown in table 6, all the path coefficients were statistically significant except that of subjective norm to intention. Concerning the variables of TPB, Attitude (β= 0.33, t = 5.03, p<0.001) and perceived behavioral control (β= 0.16, t = 2.97, p<0.01) were significantly related to the separation intention of take-away waste, which supported the hypotheses H1a and H1c. But subjective Norm (β= 0.08, t = 1.51, p>0.05) showed no significant effect on intention, hence H1b is rejected. Concerning the conditional constructs included in the TPB, both Facilities (β= 0.50, t = 6.11, p<0.001) and Time pressure (β= -0.20, t = -3.27, p<0.01) had significant effects on the intention to separate takeaway waste, with facilities being positive and time pressure being negative. Thus Hypotheses H3 and H4 were supported. Furthermore, concerning the effects of environmental concern over TPB constructs, all the

coefficients were statistically significant. Hence, H2a, H2b and H2c were all supported.

Then, the comparison between the original and the extended TPB model were made. The results showed that the original one could explaine 64% of the variance in separation intention, while the proposed model reached 71%. That is to say, adding environmental concern, time pressure and facilities into the TPB as indicators increased the explained variance by 7% ($\triangle R2 = 7\ \%$, $p<0.01$), indicating that the proposed model achieved good predictive power.

Table 6 Results of path coefficients and hypotheses testing

Path	Path coefficient	T-value	Hypothesis	Results
ATT -> INT	0.33	5.03***	H1a	Supported
SN ->INT	0.08	1.51	H1b	NS
PBC -> INT	0.16	2.97**	H1c	Supported
EC ->ATT	0.7	14.7***	H2a	Supported
EC -> SN	0.74	13.82***	H2b	Supported
EC -> PBC	0.66	12.81***	H2c	Supported
FAC ->INT	0.5	6.11***	H3	Supported
TP -> INT	-0.2	-3.27**	H4	Supported

* p<0.05; ** p<0.01; *** p<0.001

4.3 Mediating effect testing

Previous studies indicate that environmental concern affects pro-environmental behavior indirectly, where constructs in original TPB model act as mediators (Aman et al., 2012). Following Baron and Kenny (1986), the mediating effect test was implemented in three steps. Firstly, the independent variable should influence the dependent variable significantly. Then the independent variable should affect the mediator significantly. Lastly, all the variables, i.e. the independent, dependent and mediator, were all included in the regression. If both independent variables and the mediator influence the dependent variable significantly, then there is a partial mediating effect. If only the mediator influences the dependent variable

significantly, and the independent variable does not influence the dependent variable, then it can be concluded that a full mediating effect existed. If the independent variables and the mediator both do not influence the dependent variable, then there is no mediating effect.

Results of mediating analyses are presented in Table-7. The results indicated that all the constructs in the original TPB model partially mediated the relationship between environmental concern and separation intention. The result of partial mediating effect conforms to the study of Aman et al. (2012)，but concurs with Yeoh and Paladino (2007), who found full mediating effect by attitude on the relationship between environmental concern and green purchase behavior. In our context, the results demonstrated that environmental concern posits indirect influence on the intention via subjective norm, attitude and perceived behavioral control. The result shows that an increase in separation intention relies on the combined effects of the original TPB constructs and general environmental concern.

Table-7 Results of the mediation effects

IV	M	*DV*	IV→DV	IV→M	IV + M→ DV		Mediating
					IV→DV	M→DV	
EC	ATT	SI	.741***	.712***	.493***	.423***	Partial
EC	SN	SI	.741***	.540***	.597***	.266***	Partial
EC	PBC	SI	.741***	.476***	.564***	.371***	Partial

IV independent variable, M mediator, DV dependent variable

* p<0.05; ** p<0.01; *** p<0.001

5. Discussion, conclusions and limitations

Management of take-away waste in workplaces has become a serious problem in Chinese cities while the separation of the mixed waste is regarded as a promising solution. The results of this paper demonstrated that consumers' intention to separate the take-away waste in workplaces could be

predicted by six constructs included in this study. The result indicated that necessary facilities provided by the local authorities and property management companies were the most essential factor to stimulate and guarantee individuals to separate the takeaway waste in workplace, which conforming to previous studies . And it is the same in the context of household waste separation in China, Zhang et al. (2016) indicated that 24.1% more of the total household waste would be separated and recycled if the sorting and recycling facilities were readily accessible. In practice, the strategy of providing facilities to promote sorting waste will be effective only when the facilities provision is designed in accordance with individuals' requirements (Lorenz et al., 2017). Here in the context of workplaces, there are two points should be emphasized when providing the facilities. Firstly, since the take-away waste is a mixed kind, so proper facilities should be designed and provided. Classified bins, such as bins for disposable tableware and plastic waste, food waste, and other recyclable waste (tissues, paper-made cups) should be provided separately. If there were not separated bins specifically design for separation of mixed waste, consumers may feel inconvenient and unable to separate waste even if they thought they should do, and had to throw all the waste in one bin. Secondly, the waste should be collected and transported to the refuse collection in time, avoiding leachate percolation and foul odors in workplace. Unlike ordinary wastes in workplaces, leftovers in the take-away waste may release foul odor and become breeding grounds for mosquitoes, especially in warm and hot weather (Karim Ghani et al., 2013). Collecting and transporting in time may make the office environment tidy and hygienic, which in turn enhances the benefits perceived by the consumers and will lead to more involvement in the compulsory separation behavior, conforming to the effect of past behavior in social cognitive theory (Phipps et al., 2013). Municipal services of waste collection and transport systems were regarded as vital and costly

(Faccio et al., 2011), so the local government and the property management companies should provide adequate facilities and in-time collection and transportation. During the pilot survey, some people complained to us that the odor was really awesome and intolerable, so transporting the leftovers in time may stimulate individuals' intention of compulsory waste separation.

Another conditional factor, the time pressure, was also found to be a significant indicator of intention, conforming to the previous studies (Lorenz et al., 2017). This suggested that time pressure was particularly important in predicting intention and behavior. If the individuals felt a tight schedule in finishing the whole procedure, they would prefer not to separate the takeaway waste and thrown it away together. In the convenience survey, most of the respondents highlighted that time pressure was the most prominent factor that constrain them from separating the food leftovers and other plastic waste. Generally, the lunch time of most companies in CHIDZ range from one to two hours. In case of summer, people would prefer to take a nap after lunch which would make it tight and time-consuming to separate takeaway waste in workplace. In order to encourage individuals to handle separation behavior voluntarily, the companies are suggested to give another 30 minutes for lunchtime. While for the individuals, they should plan the lunchtime more efficiently by making orders in advance so as to reduce waiting time.

In this paper, environmental concern has strong effects on the attitude, subjective norm and perceived behavioral control with coefficients lies between 0.66 and 0.74, supporting propose of (Ajzen and Fishbein, 1980). At the same time, partial mediating effects indicate that environmental concern influences separation intention indirectly, and constructs in original TPB model, i.e. attitude, subjective norm and perceived behavioral control, partially mediate the effect of consumers' environmental concern on separation behavior. This result certified that general concern can have an

important indirect effect on behavior via behavior-specific beliefs, conforming to the study of Ajzen and Fishbein (1980), Bamberg (2003) and Tai et al. (2011). It is predicted that residents' awareness and behaviors decreased by 40% and 30% respectively due to lack of public education (Tai et al., 2011). To promote separation behavior of take-away waste in workplace, the government should focus on the propaganda of general environmental protection ideas as well as specific beliefs and knowledges of food waste separation. On one hand, the publicity and education of solid waste sorting should be provided by the public media, the government and the property management companies. On the other hand, courses and campaigns should be implemented in all levels of schools to strengthen the general concern for the environmental problems, since the youth is the governor of the future world (Kanchanapibul et al., 2014).

For the constructs of original TPB model, only the path coefficient between subjective norm and separation intention is not statistically significant, which support meta-analyses of Armitage and Conner (2001b). In the meta-analysis, the subjective norm-intention correlation is significantly weaker than the other two relationships with intention (compared to attitude–intention correlation qs = .19, $p<.01$; compared to PBC–intention correlation qs = .11, $p<.05$) (Armitage and Conner, 2001b). This is not surprising in Chinese context. The Chinese government initiated a pilot campaign of municipal solid waste separation from year 2000, with limited success achieved over 17 years' implementation. It is predicted that although residents' awareness consistently increased in the 10 pilot cities, the norms concerning source separation is still in low level (Tai et al., 2011). Since the separation practice of food remnant has not been implemented in most of the cities, the norm has not formed and the participants feel less pressure from important people around them. Under a cultural atmosphere featured in collectivism (Furnham et al., 2012), less norms and pressure may

lead to low separation intention of the take-away waste in China. In 2017, the Chinese government initiated a new pilot campaign of mandatory solid waste separation implemented in 46 cities. In some pilot cities, household food remnants is included in the sorting list, which will contribute to better sorting practices and improve the effects of subject norms over behavioral intention of take-away remnants.

Moreover, the inclusion of environmental concern and conditional factors (facility and time pressure) into the TPB model had increased the predictive power of the proposed model (R^2=71%), compared to that of the standard TPB model (R^2=64%). At the same time, SRMR of the proposed model (SRMR=0.055) is much lower than that of the standard TPB model (SRMR=0.064). All the figures confirmed the improvement of the proposed model to the standard TPB model.

Although our research has reached some interesting results, some limitations still exist in this study. Firstly, the study limited itself to the staff working at office building only. The restricted sampling setting and small sample may bias the result. Since people working in the office building are generally well educated, gaining higher income and are more prone to take pro-environmental behavior which may lead to self-selection biases of the respondents in this study. It is indicated that people who are more pro-environmental might be motivated to participate in the survey, leading to over representing in the research (Hage et al., 2009). In further research, respondents with diversified disciplines, occupations, age and regions should be included in the survey. Secondly, online survey is used here and most of the data are collected by social media which may cause self-selection and nonresponse biases (Kraut et al., 2004). In further research, more off-line surveys and experiments should be used. Thirdly, although it is a practice of using questionable and negatively worded to guard against acquiescence or response set behaviors (Cronbach, 1950; Kraut et al., 2004), the diversified

frame of the items (some are statements and others are questions) may lead to survey question effects or equivalency framing effects (Levin et al., 1998). In future studies, the questionnaire should be carefully designed to avoid framing effects. Additionally, items concerning other pro-environmental behavior in workplaces (paper separation and energy conservation) should be included, to test the effects of behavior in other contexts over the targeted one as stated in SCT. Fourthly, there are lots of theories used in pro-environmental behavior researches and each of them has its own advantages and limitations. In later research, different theories such as SCT, TPB and NAM theories may be applied, incorporated or compared to make deep analysis in this domain. Lastly, this research focused on intention but not the actual behavior. Since difference between intention and behavior existed (Ajzen and Fishbein, 1980), further studies may report the actual behavior regarding the sorting and separation of food delivery waste in workplace.

Declaration of conflicting interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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