

The Extension of the Theory of Planned Behavior to Predict the Use of Public Transport

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ABSTRACT—*This paper is aimed to develop a predictive model of consumer behavior in synthesizing the theory of planned behavior and consumer motivation. The influence of self-determination on the relationship between normative components and behavioral intentions was investigated, which represent the integration of the Theory of Planned Behavior (TPB) and the Self-Determination Theory (SDT), to provide a comprehensive understanding of the effects of intrinsically-based and extrinsically-based motivation on behavioral intentions. A total of 520 valid questionnaires in the context of public transport were used for the statistical analysis. The results showed that attitudes, perceived behavioral control and personal norms were significant indicators to predict the use of public transport, respectively. The findings also highlighted that the environmental behavior of consumers with high levels of self-determination was significantly predicted by personal norms.*

Keywords— Consumer Environmental Behavior, Theory of Planned Behavior, Self-Determined Motivation, Public Transport

1. INTRODUCTION

In order to pursue sustainable development and management, the role of the environment in consumer behavior has become an important research topic for both researchers and marketers [1][2][3]. Generally, environmental consumer behaviors reflects any consumers' actions directed toward the remediation of environmental issues/problems [4]. Studying consumer environmental behavior enables researchers to predict how consumers will react to promotional messages and to understand why consumers behave the way they do [5][6][7]. It is assumed that if researchers know more about consumer behavior, they can design suitable marketing strategies and promotional messages that will influence consumers more effectively [5][6][7]. Consequently, there has been substantial behavioral research interest in exploring possible reasons to more effectively predict consumer environmental behavior in daily life.

Behavioral research is presented as a way to increase our knowledge about consumer behavior and explain factors that predict behavior in daily life. Many studies on behavioral research have demonstrated that the traditional continuum model of behavioral change (i.e. the Theory of Planned Behavior, TPB) have good explanatory power across a wide variety of decision-making contexts. According to the TPB, behavioral intention is the best predictor of a given behavior and that intention is predicted by three conceptually independent determinants; attitudes towards the behavior, subjective norms and perceived behavioral control. However, the factors suggested above appear not to be completely appropriate in the analysis and prediction of consumer environmental behavior, studies have argued that subjective norms account for a relatively low level of variance in consumers' intention to perform a specific behavior [8][9][10]. Subjective norms are perceived expectations or social pressures from important referents and are seen as external motives influencing behavioral intention [11][12]. Strategies for environmental campaigns focusing only on extrinsic motives (such as incentives, rewards or subjective norms) are weak predictors of environmental behaviors. Underlying this assertion is the

logic that when external motives are weak, behavior will only continue if the individual has high levels of self-determination to act on their intentions [13]. Previous studies argue that because external motives are less internalized and integrated into the self [14][15], they are less likely to contribute to environmental behaviors.

Studies have further suggested that personal norms may act as an additional predictor to enhance the intrinsic component of behavioral intention [16][17]. A sense of personal obligation toward a behavior would deeply influence the motivational force of his/her intentions [16]. While personal norms have been included in some TPB research they are still not widely incorporated [18]. De Young (1986) [19] suggests that intrinsic motivation to act is an essential predictor of behavior. The intrinsic motivations are positively associated with the occurrence of environmental behaviors [13]. Motivation literature such as Self-Determination Theory (SDT) assumes that different levels of self-determination reflect the relative degree of autonomy of the behavior exhibited by an individual [15]. High levels of self-determination (e.g. intrinsic, integrated and identified regulation) are related to autonomous behaviors regulated by intrinsic control, such as personal norms.

The current research aims to address the issue and contributes to the consumer environmental behavior. To improve the predictive ability of behavioral models, intrinsic motives should be integrated into the behavioral model. Intrinsic motives are likely to influence behavioral intentions in parallel with other predictors included in the TPB. Therefore, the inclusion of personal norms into a modified TPB model was considered. Furthermore, to develop a deeper understanding of consumers' intrinsic motives, we also propose the integration of SDT into the TBP model. Incorporating self-determination into the model will provide insight into consumer motives. Following this introduction, the second section of this paper presents a development of research framework and empirical context. The third section then describes details of the methods used to test our behavioral model. Finally, the results are discussed.

2. RESEARCH FRAMEWORK

The TPB forms the foundation of the current model of consumer environmental behavior. Consistent with the TPB, three predictors (i.e., attitudes toward the behavior, subjective norms and perceived behavioral control) are proposed, to significantly contribute to the behavioral intention of a given behavior [11]. However, the TPB has been criticized for not providing a complete account of human behavior, suggesting other variables may add predictive power to the model [20][21]. The current research suggest that focusing solely on extrinsic elements (e.g., subjective norms) as motivators of a given behavior is insufficient. Research should also investigate more intrinsic elements, such as personal norms. Personal norms are viewed as internal motivation that reflects a person's own feelings about whether he/she should perform a behavior [22]. Feelings of personal obligation express a person's core self and deeply motivate a person to engage in a behavior [16]. Personal norms are proposed to be intrinsic components of motivation, which differs from extrinsic components such as subjective norms. Thus, the inclusion of normative support from both intrinsic features (e.g. personal norms) and extrinsic features (e.g. subjective norms) should increase the predictive ability of the model.

Motivation literature further explains why individuals engage or disengage in behavioral performance. A dominant theory of motivation is SDT [14][15], which argues that types, rather than the extent of motivation, is important when determining how likely a person is to complete a behavior. According to SDT, motivation is endogenous, as behavior is initiated intentionally [23]. This contrasts with other motivational theories, as it suggests motivation is not the result of expected reward but rather an act of individual will [23]. Different types of self-determination reflect the relative degree of autonomy of the behavior exhibited by an individual [15]. Intrinsic regulation is accompanied by a sense of interest, personal choice and pleasure, so the behavior reflects a true sense of self. Integrated regulation occurs when an individual has accepted externally-imposed values and goals and has integrated them into a part of his/her self-concept. Identified regulation occurs when a behavior is undertaken because of its value, importance or usefulness in the individual's mind [15]. These three regulations are viewed as high self-determined motivation because they express the motivation is internalized and integrated into a person's self-system [24]. Behavior regulated by high self-determined motivation is more likely to be related to internal forces. Thus, high levels of self-determination (i.e. intrinsic, integrated and identified regulation) lead to positive autonomous actions such as autonomous learning behavior and the regular purchasing of environmentally-friendly products, blood donation, and among others [14][15][25][26].

Of note is that personal norms and high self-determined motivation are conceptually similar, as they both reflect the perceptions of self-expectations which internally motivate one's behavioral intention. We argue, however, that while similar, they are in fact distinct constructs, as the former emphasizes commitment to internalized values into one's cognitive structure, whereas the later emphasizes the degree of one's autonomy. Personal norms are somewhat embedded in high levels of self-determination because the perceptions of self-expectations internally motivate one's behavioral intention and performance. We suggest that high levels of self-determined motivation are assumed to explain why personal norms have different influences on behavioral intentions under different circumstances. The integration of different types of motivation into the TPB should help to comprehensively explain how consumers develop behavioral intentions. Based on the discussions above, our conceptual model is depicted by the paths linking hypothesized relationships between variables, shown in Figure 1.

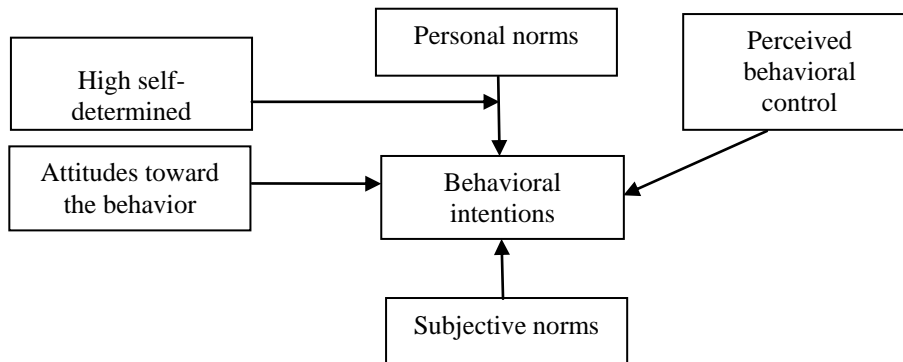


Figure 1: Research Framework

2.1 Environmental context

As presented in IPCC's report, it is notable that transport also contributes significantly to human-induced carbon dioxide emissions [27]. In line with IPCC's report, the transport sector makes up 13.77% of Taiwan's emissions in 2013. Regarding the contributions of transport emissions, road transport was the main source of transport emissions in 2013 [28].

Studies have pointed out the essential issues related to public transport. A sustainable transportation report mentioned that the usage of public transport in Taiwan was less than 50 % [29]. The Ministry of Transportation and Communications (MOTC) also indicates that the usage of public transport in Taiwan was approximate 15 % in the past recent five years. MOTC's (2014) [30] further survey asked respondents' intentions about using public transport. The contentions of more than 50 % of the respondents said that they would not use public transport in the following three years. In other words, consumers can recognize that using public transport will help to reduce carbon dioxide emissions but this recommended action has failed to obtain public support.

Transport is one of the major sources of Taiwan's carbon dioxide emissions and the contribution from transport is predicted to increase in the future [31]. Mitigating the carbon dioxide emissions has been recognized as an urgent long-term environmental issue from international communities. Meeting the goal of the emission reduction can not only be achieved by technology, it is necessary to investigate how the individual reduces their own carbon emissions through changes in behavior. More attention should be paid to understand the mitigation of individual behaviors [32]. Consequently, this research aims to understand the key predictors that drive individual's environmental behavior, particularly in using public transport. The action will be using public transport (e.g. bus, train, BRT or MRT) to pursue sustainable development and management.

2.2 Research hypothesis

2.2.1 Attitudes toward the behavior and behavioral intentions

According to the TPB, attitude does not determine behavior directly; rather, it influences behavioral intentions that in turn influence consumer behaviors. Thus, the attitude toward a behavior is an antecedent of behavioral intention. The attitude toward the behavior is determined by an individual's favorable or unfavorable evaluation of the outcomes associated with the behavior [33]. Consumers who believe that performing a given behavior will lead to positive outcomes will hold a favorable attitude toward performing the behavior. Consumers are thus more likely to perform the behavior [33][34]. Research in the transport field service provides that a positive relationship between attitude and intention exists. For example, attitude is a critical factor to determine the intention to use the transferium in Netherlands (De Groot and Steg, 2007) [35]. Similarly, Chen and Chao (2011) [36] investigate two different users (motorcycle and car users) regarding the intentions of public transit. Their results indicate that attitude is a significant determinant to affect switching intention toward public transit for both motorcycle and car users. This study assumes that consumers who hold favorable attitudes toward using public transport will be more likely to perform that behavior if they believe that public transport they use will result in good outcomes. The more favorable the attitudes toward using public transport, the stronger the consumer's intention to use public transport will be. Consequently, it is posited that:

H₁: Attitudes toward using public transport will positively influence behavioral intention to use public transport

2.2.2 Subjective norms and behavioral intentions

Subjective norms are also an antecedent of behavioral intentions in the TPB. A subjective norm is conceptualized as the social pressure that consumers feel about whether to perform a behavior or not. Fishbein and Ajzen (1975) [37] argue that behavior is more likely to be altered when individuals perceive that it is subject to a given subjective norm. A

number of studies reveal that, social pressure, such as family members' opinions, friends' views and neighbors or expert referents' opinions, influences behavioral performance [4][33]. Human behavior is thus shaped by other people's points of view [38]. Several studies have also highlighted the importance of a related person in encouraging others to participate in specific actions [39][40]. Normative support from important referents should have a significant effect on behavioral intentions. For example, Farag and Lyons (2010) [41] indicate that the encouragement from other people around individuals significantly affect themselves to consult public transport information in planning a journey. Chen and Chao (2011) [36] conduct TPB to examine commuters' intention toward public transit and found that subjective norm is the most influential factor among the three TPB variables. In accordance with the TPB, it is assumed that consumers who believe that important referents think they should use public transport will perceive social pressure to do so. The more consumers believe that there is normative support for using public transport, the stronger the consumer's intention to use public transport will be. Consequently, the following hypothesis is proposed:

H₂: Subjective norms will positively influence behavioral intention to use public transport

2.2.3 Perceived behavioral control and behavioral intentions

To increase its capacity for prediction, Ajzen (1985) [42] extended the TRA by adding perceived behavioral control (PBC). The degree of PBC is the third antecedent of intention [33]. PBC represents a consumer's beliefs about the presence or absence of factors that facilitate or impede the performance of a behavior. Consumers will have strong behavioral intentions to perform a specific behavior if they perceive that they can easily act on the behavior [33][34]. Abrahamse et al. (2009) [43] point out that commuters' intentions to reduce car usage are explained by their perceived possibilities and difficulties for reducing car use. The stronger commuters' intentions to reduce car use for commuting, the higher are their perceived possibilities for reducing car use. However, in Chen and Chao's (2011) study [36], perceived behavioral control had no significant effect of on car-use intention toward public transit. Base on the discussion above, it seems that perceived behavioral control may vary as a function of context. In accordance with the TPB, the current study assumes that the consumer's behavioral intention to use public transport is influenced by elements of PBC, such as how easily the consumer can enact the behavior or choose an appropriate behavior. More specifically, the more required resources and opportunities consumers think they possess, and the fewer obstacles or impediments they anticipate, the greater the consumers' intentions to use public transport should be. Consumers who perceive that using public transport is easy are more likely to use public transport. Consequently, the following hypothesis is proposed:

H₃: Perceived behavioral control will positively influence behavioral intention to use public transport

2.2.4 Personal norms and behavioral intentions

The reviews of the TPB empirically indicate that subjective norms are limited in their contribution to behavioral intentions [8][9][44]. To overcome this, personal norms have been introduced as an additional predictor to enhance the normative component influencing behavioral intention and actual behavior in a variety of behavioral domains [45][46]. Consumers comply with subjective norms due to social pressure [33] and with personal norms because they feel it is right thing to do [17]. Personal norms express the consumer's core self. The sense of personal obligation to perform a given behavior will deeply influence the motivational force of their intention into action [16][17]. These normative standards are more likely to encourage the individual to carry out the intended behavior. For example, Abrahamse et al. (2009) [43] investigated both self-interest and moral variables that accounted for the intentions of commuters to reduce their care use. In their study, the intention to reduce car use is mostly explained by morality (i.e. personal norms). Thus, the current study assumes that consumers with feelings of strong moral responsibility are more likely to use public transport actively. Consequently, it is posited that:

H₄: Personal norms will positively influence behavioral intention to use public transport

2.2.5 Moderating effects of self-determined motivation

In the field of motivation research, Deci and Ryan (1985) [14] suggest that the degree of internalization and integration of motivation is important for behavioral performance. SDT also assumes that behaviors occur more frequently as they become more integrated into a person's self-system [15]. Greater internalization of values and regulations appears to lead to more behavioral effectiveness and greater volitional persistence [15]. Events that strengthen these feelings are hypothesized to lead to gains in self-determination, while events that weaken these feelings are hypothesized to lead to losses in self-determination. For example, one's autonomy has been associated with increases in self-determination [8][47][48]. Conversely, feelings of incompetence or surveillance have been related to losses in self-determination [8][47][48].

Personal norms reflect moral responsibilities that are integrated with consumers' cognitions about what they think they should do. Personal norms may reflect a more autonomous form of motivation, because they reflect a deeper level of internalization and integration of norms into a person's cognitive structure [49]. Consumers with strong personal norms for specific behaviors should have positive outcomes, as well as positive images of the self. Similarly, when a person's motivation to act on a behavior becomes more integrated into their cognitive structure and better aligned with his/her

beliefs and goals, an individual will be more likely to enact a behavioral performance [8].

Based on SDT, different levels of self-determination reflect the relative degree of autonomy of a behavior, as it is perceived by an individual [14]. Self-regulated behavior represents high self-determined types of motivation because behaviors are increasingly self-determined [24][48][50]. More self-determined types of motivation are likely to result in more autonomous behavior [26]. When a person's motivation to act on a behavior becomes integrated into their cognitive structure and is better aligned with their beliefs and goals, they are more likely to perform a behavior [8]. SDT further identifies three types of high self-determined motivation: intrinsic, integrated and identified regulation.

The current study assumes that both personal norms and high self-determined motivation reflect perceptions of self-expectations and internally motivate one's behavioral intention. Consumers are more likely to actively engage in specific behaviors when their own beliefs and motivation about performing those behaviors align with their feelings of moral responsibility. For example, consumers are more likely to actively use public transport when they feel a moral responsibility to do so. As a result, they will derive a sense of enjoyment or satisfaction (e.g., intrinsic regulation), an integration of self-concept (e.g., integrated regulation), or an agreement with one's values or goals (e.g., identified regulation), when using public transport. It is logical to argue that high self-determined motivation may have a significant influence on the relationship between personal norms and behavioral intentions. The relationship between personal norms and behavioral intentions is expected to be strong among consumers who are motivated by high levels of self-determination. Consequently, the following hypotheses are proposed:

H_{5a}: The effect of personal norms on behavioral intention to use public transport will be stronger as people are motivated by intrinsic regulation

H_{5b}: The effect of personal norms on behavioral intention to use public transport will be stronger as people are motivated by integrated regulation

H_{5c}: The effect of personal norms on behavioral intention to use public transport will be stronger as people are motivated by identified regulation

3. METHODOLOGY

3.1 Procedure and data collection

To test the proposed consumer behavioral model, a context (i.e., public transport) relating to consuming environmentally-friendly services were examined. Taichung station is an essential transfer center which provides various transport services including train, bus and BRT. According to reports from the Taiwan Railways Administration (TRA), the amount of passengers was around 637,881 per day at Taichung Station in 2014 [51]. In addition, the bus transportation volume was obtained in 2014 with 386,953 passengers per day [52](Bureau of Transportation, 2015). Most of the bus routes serve Taichung Station as a main stop. Thus, the convenience sampling method was conducted at Taichung Station, Taichung city, Taiwan in 2014, a total of 600 questionnaires were issued and 520 valid questionnaires were collected, with the effective response rate at 87%. Generally, respondents' age ranged from 25 to 45 years, with a roughly equal gender distribution. Thirty-nine percent of respondents had completed a Bachelor degree. Over one quarter of residents reported that their monthly income were between NTD \$20,000 to NTD \$40,000.

3.2 Measurement of the constructs

Items from prior research were used as the basis of measures for the constructs. A protocol analysis and a pre-test were also used to improve measures and fit the context investigated [53]. Five-point Likert scales anchored by 1 (strongly disagree) and 5 (strongly agree) were used throughout the surveys. The items used to measure attitudes toward the behavior (five items), subjective norms (four items), perceived behavioral control (four items) and behavioral intention (four items) were drawn from Ajzen's (2002) scale [54]. Four items measuring personal norms from Oom Do Valle et al. (2005)'s scale [17]. Chen (2009)'s measures [24] for the three types of self-determined motivation were adopted, measured using three-items for each type. A full list of items for each construct is provided in the Appendix.

3.3 Data validation

3.3.1 Offending estimates of the data

The offending estimates were first accessed before conducting confirmatory factor analysis (CFA) [55]. The common forms of offending estimates that appear in measurement are negative error variance, standardized loading of the manifest variables exceed one, and high standard errors for the estimate coefficients [56]. Eight constructs with thirty items were estimated to confirm the structure of the data. The results show that there were no offending estimates of the data in the current study.

3.3.2 Confirmatory factor analysis

Consistent with the two-step approach suggested by Gerbing and Anderson (1988) [57], this study first confirmed that each measure taps facets of the intended construct (convergent validity) and that the constructs are distinct from each other (discriminant validity). The CFA results indicated that the measurement model met satisfactory levels of goodness-of-fit statistics. For example, acceptable absolute fit indices ($\chi^2/df = 2.984$, GFI = .89, RMR = .07, and RMSEA = .06), incremental fit indices (TLI = .90, CFI = .93, and IFI = .91), and parsimonious fit indices (PNFI = .81 and PGFI = .72) were demonstrated [58][59]. Table 1 showed that all the Cronbach alpha coefficients range between .80 (personal norms) and .92 (subjective norms) and thus exceed the suggested threshold of .70 [60][61]. Additionally, the CFA results revealed that the composite reliability (CR) of the scales exceed the recommended of .70 threshold as well as the average variance extracted (AVE) estimates were above .50, providing evidence of convergent validity [59].

Table 1 The results of confirmatory factor analysis

| Construct/items | Mean | SD | α | CR | AVE |
|--|------|------|----------|-----|-----|
| Attitudes toward the behavior | | | .91 | .95 | .81 |
| 1. I will find using public transport to be good | 3.82 | .689 | | | |
| 2. I will find using public transport to be worthy | 3.97 | .669 | | | |
| 3. I will find using public transport to be sensible | 4.02 | .690 | | | |
| 4. I will find using public transport to be pleasant | 4.01 | .667 | | | |
| 5. I will find using public transport to be important | 3.82 | .761 | | | |
| Subjective norms | | | .92 | .95 | .84 |
| 1. My friends think that I should use public transport | 3.62 | .754 | | | |
| 2. My parents think that I should use public transport | 3.67 | .745 | | | |
| 3. My colleagues think that I should use public transport | 3.63 | .754 | | | |
| 4. Environmental experts think that I should use public transport | 3.64 | .726 | | | |
| Perceived behavioral control | | | .82 | .89 | .68 |
| 1. I can easily use public transport | 3.44 | .810 | | | |
| 2. The decision to use public transport is entirely up to me | 3.78 | .758 | | | |
| 3. I can use public transport if I have sufficient budget | 3.77 | .705 | | | |
| 4. I can use public transport if I have sufficient time | 3.91 | .710 | | | |
| Personal norms | | | .80 | .87 | .63 |
| 1. I feel a strong personal obligation to use public transport | 3.81 | .770 | | | |
| 2. I would feel guilty if I did not use public transport | 3.14 | .864 | | | |
| 3. I am willing to use public transport on a regular basis | 3.75 | .670 | | | |
| 4. I would be a better person if I used public transport more often | 3.73 | .749 | | | |
| Behavioral intention | | | .87 | .94 | .80 |
| 1. I intend to use public transport | 3.94 | .666 | | | |
| 2. I plan to use public transport | 3.75 | .723 | | | |
| 3. I try to use public transport | 3.92 | .649 | | | |
| 4. I will use public transport | 3.66 | .745 | | | |
| Intrinsic regulation | | | .89 | .94 | .84 |
| 1. Using public transport is enjoyable | 3.72 | .749 | | | |
| 2. I find using public transport pleasurable | 3.65 | .741 | | | |
| 3. I get satisfaction from using public transport | 3.60 | .715 | | | |
| Integrated regulation | | | .86 | .92 | .78 |
| 1. Using public transport is part of the way I have chosen to live my life | 3.68 | .714 | | | |
| 2. Using public transport has become a fundamental part of who I am | 3.43 | .822 | | | |
| 3. Using public transport is an integral part of my life | 3.46 | .818 | | | |
| Identified regulation | | | .85 | .93 | .81 |
| 1. I think it is important to use public transport. | 3.86 | .675 | | | |
| 2. I value the benefits of using public transport. | 3.83 | .668 | | | |
| 3. Using public transport is a sensible thing to do | 3.84 | .673 | | | |

Discriminant validity was demonstrated by comparing AVE of each measure with the square of correlations between constructs [62]. For all constructs AVE is greater than the square of the interfactor correlations between any two constructs of each eight dimensions, supporting the discriminant validity of the measures, as presented in Table 2.

Table 2: Interfactor Correlations and Squares of Interfactor Correlations for Factors

| | Mean | SD | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|-------|------|------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-----|
| 1.ATT | 3.93 | .595 | .81 | | | | | | | |
| 2.SN | 3.64 | .668 | $\phi=.530^{**}$ $\phi^2=.280$ | .84 | | | | | | |
| 3.PBC | 3.73 | .601 | $\phi=.619^{**}$ $\phi^2=.383$ | $\phi=.496^{**}$ $\phi^2=.246$ | .68 | | | | | |
| 4.PN | 3.60 | .603 | $\phi=.595^{**}$ $\phi^2=.354$ | $\phi=.493^{**}$ $\phi^2=.243$ | $\phi=.517^{**}$ $\phi^2=.267$ | .63 | | | | |
| 5.BI | 3.82 | .601 | $\phi=.647^{**}$ $\phi^2=.418$ | $\phi=.484^{**}$ $\phi^2=.234$ | $\phi=.566^{**}$ $\phi^2=.320$ | $\phi=.689^{**}$ $\phi^2=.474$ | .80 | | | |
| 6.INR | 3.66 | .663 | $\phi=.632^{**}$ $\phi^2=.399$ | $\phi=.506^{**}$ $\phi^2=.256$ | $\phi=.553^{**}$ $\phi^2=.305$ | $\phi=.664^{**}$ $\phi^2=.440$ | $\phi=.655^{**}$ $\phi^2=.429$ | .84 | | |
| 7.IGR | 3.52 | .693 | $\phi=.502^{**}$ $\phi^2=.252$ | $\phi=.430^{**}$ $\phi^2=.184$ | $\phi=.481^{**}$ $\phi^2=.231$ | $\phi=.572^{**}$ $\phi^2=.327$ | $\phi=.594^{**}$ $\phi^2=.352$ | $\phi=.696^{**}$ $\phi^2=.484$ | .78 | |
| 8.IDR | 3.84 | .590 | $\phi=.650^{**}$ $\phi^2=.422$ | $\phi=.570^{**}$ $\phi^2=.324$ | $\phi=.590^{**}$ $\phi^2=.348$ | $\phi=.520^{**}$ $\phi^2=.270$ | $\phi=.628^{**}$ $\phi^2=.394$ | $\phi=.664^{**}$ $\phi^2=.440$ | $\phi=.661^{**}$ $\phi^2=.436$ | .81 |

Note: ATT: attitudes toward the behavior; SN: subjective norms; PBC: perceived behavioral control; PN: personal norms; BI: behavioral intention; INR; intrinsic regulation; IGR; integrated regulation; IDR: identified regulation; ϕ : interfactor correlations; ϕ^2 : square of interfactor correlations; average variance extracted appears on the diagonal

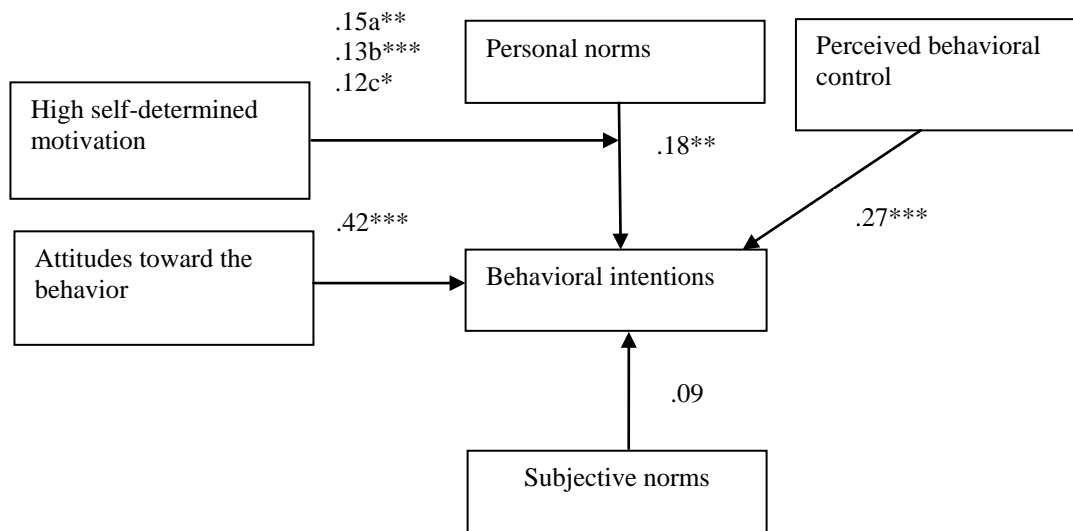
4. RESULTS

The second step of the analysis used structural equation modeling to examine the proposed relationships between the constructs in our conceptual model. The data were subjected to structural equation analysis in AMOS 19.0 using the maximum likelihood estimation method. The fit statistics indicated that the model exhibited an acceptable fit with the data, acceptable absolute fit indices ($\chi^2/df = 3.08$, $p = 0.00$, GFI = .88, RMR = .07, and RMSEA = .06), incremental fit indices (TLI = .90, CFI = .90, and IFI = .91), and parsimonious fit indices (PNFI = .80 and PGFI = .70). The standardized estimates for the various model paths are shown in Figure 2. The results indicated that attitudes toward the behavior ($\beta = .42$, $p < 0.001$) had a positive impact on behavioral intention, which supports H₁. Subjective norms ($\beta = .09$, $p = .47$) had no significant impact on behavioral intention; therefore, H₂ was not supported. Perceived behavioral control ($\beta = .27$, $p < 0.001$) and personal norms ($\beta = .18$, $p < .01$) had a significant and positive relationship with behavioral intention, providing support for H₃ and H₄.

To test the moderating effects of the different types of self-determined motivation on the relationships between the personal norms and behavioral intentions, all scales were averaged to form a composite. Once the composites were formed we mean-centered the constructs to avoid any potential threat of multicollinearity when calculating interaction terms. The interaction terms were created by the product of the mean-centered constructs. Each of three different two-way interaction terms (e.g., intrinsic regulation*personal norms) were tested [63]. As shown in Figure 2, the results showed that intrinsic regulation ($\beta = .15$, $p < .01$), integrated regulation ($\beta = .13$, $p < .01$) and identified regulation ($\beta = .12$, $p < .05$) were found to have positive significant impacts on the relationship between personal norms and behavioral intention, respectively. This supports H_{5a}, H_{5b} and H_{5c}. The summary of the hypotheses results is shown in Table 3.

Table 3 The summary of hypotheses results

| Hypothetical Path | Expected sign | Research results |
|---|---------------|------------------|
| H ₁ : Attitudes towards the behavior → Behavioral intention | + | Support |
| H ₂ : Subjective norms → Behavioral intention | + | Not support |
| H ₃ : Perceived behavioral control → Behavioral intention | + | Support |
| H ₄ : Personal norms → Behavioral intention | + | Support |
| H _{5a} : Personal norms* intrinsic regulation → Behavioral intention | + | Support |
| H _{5b} : Personal norms* integrated regulation → Behavioral intention | + | Support |
| H _{5c} : Personal norms* identified regulation → Behavioral intention | + | Support |
| H _{6a} : Subjective norms* introjected regulation → Behavioral intention | + | Support |
| H _{6b} : Subjective norms* external regulation → Behavioral intention | + | Support |



Note: a: intrinsic regulation; b: integrated regulation; c: identified regulation

Figure 2: Structural Equation Model to Predict Consumption of Public Transport

5. DISCUSSIONS

This paper provides a holistic view on consumer behavior theory in terms of integrating the TPB and SDT. The results show that consumers' behavioral intentions are determined by their attitudes, perceived behavioral control and personal norms emerged in using public transport. Personal norms were introduced as an additional predictor, to enhance the normative determinants of behavioral intention. The results indicate that personal norms have an important impact on whether consumers enact their behavioral intentions to use public transport. Those consumers who expressed a high sense of personal obligation to use public transport are more likely to perform the behavior. Personal norms are proposed to be intrinsic components of motivation, which differ from extrinsic components, such as subjective norms. There is consistent support that personal norms are a stronger predictor of behavioral intention than subjective norms [16][17][46].

The results also highlight that those consumers who hold high levels of self-determination would exhibit a stronger relationship between personal norms and behavioral intentions. The findings are consistent with the assumption of SDT that different levels of high self-determination influence behavioral occurrences. People are active in their pursuit of behaviors, which will result in a positive and coherent sense of self [15]. High self-determined motivation (e.g. intrinsic, integrated and identified regulation) reflects more autonomous behaviors that are governed by intrinsic forces such as interest and enjoyment, and thus become part of one's personal self-concept. Personal norms and high levels of self-determination both reflect the perceptions of self-expectations that internally motivate consumers' intentions. A sense of moral responsibility is more likely to influence consumers' behavioral intentions to use public transport because the motivation is aligned with the moral responsibilities embedded in consumers' cognitive structure.

5.1 Implications

The investigation of the determinants of behavioral intentions in our research provides useful insights for practitioners to develop more effective strategies, to stimulate consumers' intentions to perform environmentally-friendly behaviors. First, consumers' attitudes do have a positive impact on their intentions. More attention should be paid to potential influences of consumers' attitudes to environmental behaviors because they greatly influence their intentions. For example, the degree of concern for environment has an impact on attitudes toward specific environmental behavior as suggested by Bamberg [64]. Practitioners could provide environmental information about harmful actions contributing to environmental deterioration to arouse consumer concerns for the environment. Second, consumers are more likely to form strong intentions to behave in a certain way, if they think it is easy to do. Practitioners are advised to provide more information and alternatives that will enable consumers to more easily obtain opportunities or assessments to use public transport. Last, this research further suggest that practitioners should focus on increasing the strength of personal norms (i.e., the felt obligation to act). Interventions should make consumers focus on moral considerations when forming intentions, for example, by making consumers aware of others' challenges (e.g., greenhouse gas emissions from car or motorbike usage) and increasing the perception that using public transport could relieve those challenges.

Consumers who are motivated by high levels of self-determination (e.g., high intrinsic, integrated and identified regulation) are more likely to use public transport because the motivation for these behaviors is aligned with a sense of

personal obligation in their cognitive structure. For example, consumers are more likely to use public transport when their moral principles align with a sense of enjoyment or satisfaction derived from enacting the behavior (e.g., intrinsic regulation). It is suggested that practitioners can encourage the formation of high self-determination and develop interventions that intrinsically simulate consumers' intentions to use public transport, by increasing the perceptions of superior self-expectations.

5.2 Research limitations and future directions

As with most research efforts, the studies reported in this thesis are not without their limitations. This research is limited with regard to the generalizability. Our behavioral model was tested in an environmental context, but whether this model could be generalized to other contexts requires further empirical investigation. For example, behaviors such as volunteers of environmental protection (e.g. Earth Day) could be considered as a self-determined behavior because it depends on the actions of a group of volunteers. It would be interesting to further examine the role that different levels of self-determined motivation play in promoting environmental protection.

In addition, this research is limited, in particular, by its population. The respondents of these three studies were Australian consumers. The results of our behavioral model may not generalize to other populations. Previous studies suggest that cultural differences influence the way consumers behave [65][66]. Cultural differences in knowledge, attitudes and consciousness could mean that consumers respond differently to environmental behaviors in different countries [67]. For example, consumers who live in Asian countries are already concerned about the state of the environment. Their environmental concerns are related to the adverse impacts of environmental change on health, well-being and quality of life [68]. By contrast, Western consumers reflect a continued, broad increase in environmental consciousness [65][67]. Environmentally-conscious consumers are assumed to hold beliefs about the benefits of being environmentally friendly and they are more likely to enact environmental behaviors [65][66]. Thus, it would be useful to validate the findings of this thesis with samples drawn from Western countries in the future. More insightful conclusions could then be drawn using cross-cultural comparisons.

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Appendix Summary of construct measures

Attitudes towards the behavior (Source: Ajzen, 2002)

- I will find using public transport to be good.
- I will find using public transport to be worthy.
- I will find using public transport to be sensible.
- I will find using public transport to be pleasant.
- I will find using public transport to be important.

Subjective norms (Source: Ajzen, 2002)

- My friends think that I should use public transport.
- My parents think that I should use public transport.
- My colleagues think that I should use public transport.
- Environmental experts think that I should use public transport.

Perceived behavioral control (Source: Ajzen, 2002)

- I can easily use public transport.
- The decision to use public transport is entirely up to me.
- I can use public transport if I have sufficient budget.
- I can use public transport if I have sufficient time.

Personal norms (Source: Oom Do Valle et al., 2005)

- I feel a strong personal obligation to use public transport.
- I would feel guilty if I did not use public transport.
- I am willing to use public transport on a regular basis.
- I would be a better person if I used public transport more often.

Behavioral intention (Source: Ajzen, 2002)

- 1. I intend to use public transport.
- 2. I plan to use public transport.
- 3. I try to use public transport.
- 4. I will use public transport.

Intrinsic regulation (Source: Chen, 2009)

- Using public transport is enjoyable.
- I find using public transport pleasurable.
- I get satisfaction from using public transport.

Integrated regulation (Source: Chen, 2009)

- 1. Using public transport is part of the way I have chosen to live my life.
- 2. Using public transport has become a fundamental part of who I am.
- 3. Using public transport is an integral part of my life.

Identified regulation (Source: Chen, 2009)

- I think it is important to use public transport.
- I value the benefits of using public transport.
- Using public transport is a sensible thing to do.