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# A Comparative Study of Prospective Natural Gas for Vehicle (NGV) Buyers' Behavior Intention in Thailand

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## **A comparative study of prospective natural gas for vehicle (NGV) buyers' behavior intention in Thailand**

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### **ABSTRACT**

This study examines the prospects of how Natural Gas Vehicles (NGV) could gain more popularity, and more consumers, throughout Thailand. A survey of 500 potential consumers, comprising 100 respondents in each of the five separate regions, identified relevant geographic locations, demographic factors and their impact on behavior intention. The results of the study suggest that consumer's behavioral intentions toward NGV are affected by factors pertaining to social influences and NGV attributes. Each group contains several sub-variables and is used in verifying its individual impact on consumer's behavioral intention, while the differences in vehicle factors did not strongly affect the behavior intention.

Keywords: natural gas vehicles, buyer behavior, Thailand

## INTRODUCTION

Global warming and continuing oil price increases have become one of the most serious and appalling issues of the present day. These threatening crises are generally followed by arduous activity throughout the world, particularly in searching for alternative fuels with pollution-free properties.

Thailand is fortunate to have such an alternative fuel as NGV (Natural Gas for Vehicles) officially launched by PTT Company Ltd. It was launched to relieve the country's trading loss from import of expensive fuel and environmental problems. Although, NGV buyers tend to increase to 34,234 vehicles, the figure is still far below the target of 171,000 vehicles set by PTT in the second quarter of 2007.

Basically, behavior intention occurs when the perception of the reward from the purchase of goods or services by the consumer meets or exceeds his/her perceived sacrifice (Anderson, 1996; and Yi, 1988). Therefore, it is very significant to analyze the relationship between geographic locations, demo-graphic factors, vehicle factors, social influence, and NGV attributes, all of which influence the behavior intention of car owners, in each of the five regions of Thailand.

The findings of this study can help in setting future marketing plans with better consumer appeals for NGV. The benefits lie in helping Thailand to save on the imported costs of gasoline and also reducing air pollution in the future.

## LITERATURE REVIEW

From prior studies, the influential factors for alternative fuel are the vehicle factors which consist of type of vehicle, life-time, type of engine, and engine power. They can be considered as real factors relating to the NGV product (Byrne and Polonsky, 2001; Dearing, 2000; Berkowitz, Gallini, Miller, and Wolfe, 1985; Kazimi, 1997; Contadini, 2000; Dregfus and Viscusi, 1995).

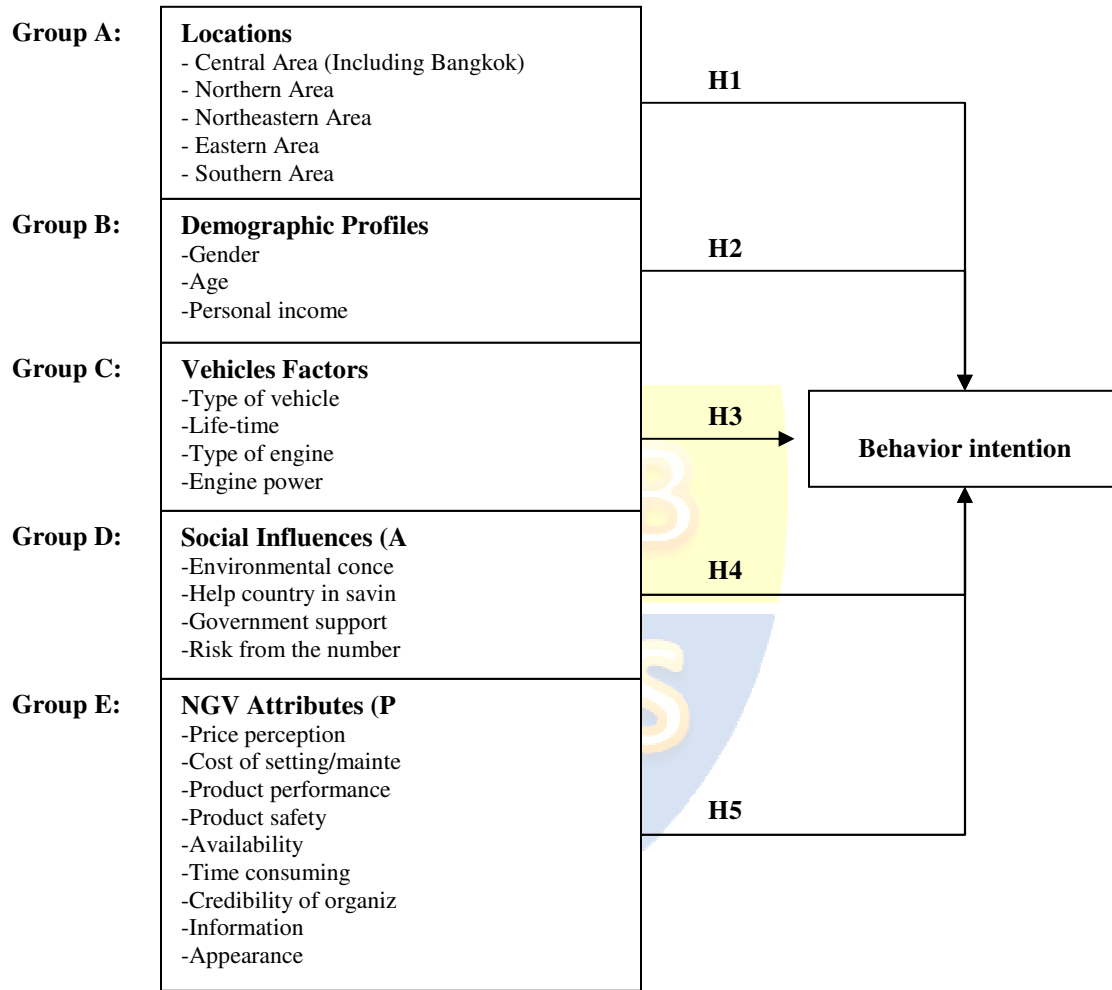
Moreover, product attributes comprise many variables consisting of price perception cost of setting/maintenance, product performance, product safety, availability, time consumption, credibility of organization, information, and appearance are also employed by Byrne and Polonsky (2001); Dregfus and Viscusi (1995); Dearing (2000) as main factors when the consumers make a decision to adopt alternative fuel for transportation.

Whereas, the social influences, which are categorized into environmental concern, help country savings, government support, and risk from the number of users, incorporate the consumer's emotional experience into the multi-attribute model has the potential of enhancing the predictability of motives and preferences to better understand intention (Schiffman and Kanuk, 2007; Talukder, Harris and Mapunda, 2007; Byrne and Polonsky, 2001; Follow and Jobber, 2005). Similar to the theory of reasoned action (TRA), intentions are influenced by personal attitude judgment and social-normative considerations. These two factors may not contribute equally to the formation of intention, but carry varying weights in influencing the intentions.

Therefore, in this study, the researchers have created a new model of the behavior intention study toward NGV non-buyer behavior. This model is shown in Figure 1.

**CONCEPTUAL FRAMEWORK**

**Figure 1: The Conceptual Framework of a Comparative Study of Prospective Natural Gas for Vehicle (NGV) Buyers' Behavior Intention**



**RESEARCH HYPOTHESES**

Twenty one hypotheses were developed based on the research objectives and classified into five groups. In group A, hypothesis 1 measures the difference between the geographical locations and behavior intention of the car owners who are non-buyers of NGV. Group B, consisting of hypotheses 2-4, measure the difference between demographic factors and behavior intention. Group C, comprising hypotheses 5-8, measured the behavior intentions and various vehicle factors. Group D, consisting of hypotheses 9-12, analyze the relationship between social influence and behavior intention. Group E, comprising hypotheses 13-21, analyze the relationships between NGV attributes and behavior intention. The twenty one null hypotheses are shown later in Table 2.

## RESEARCH METHODOLOGY

This study utilized a questionnaire to collect data from vehicle owners who are NGV non-buyers and local residents (who are living in that area, work at that area, or have a vehicle in that area) among the five regions of Thailand. Data was collected at PTT's leading oil stations in each region. The model consists of five independent variables and one dependent variable. Three non probability sampling techniques were applied in order to get the sampling unit for this research study. The data was collected from 5 provinces which are the highest ranking provinces showing Thai people who have their own vehicles registered in each region of Thailand during 1997-2007 as shown in Table 1

**Table 1: The highest ranking provinces showing Thai people who have their own vehicles registered in each region of Thailand during 1997-2007**

Thai people who have their own vehicles registered in Thailand			
Region	Highest Rank	Number (person)	Total of Region
Central Area	Bangkok	2,283,536	3,188,482
Northern Area	Chiang Mai	118,603	377,617
Northeastern Area	Nakhon Ratchasima	187,222	1,085,087
Eastern Area	Chonburi	201,754	534,564
Southern Area	Songkhla	158,430	788,974
<b>Total</b>		<b>2,949,545</b>	<b>5,974,724</b>
<b>Percentage</b>		<b>50%</b>	<b>100%</b>

Source: Land Transport Management Bureau, Department of Land Transport (12/12/2007)

### Research Instruments/Questionnaire

The research questionnaire, consisting of sixty-one questions, was divided into six parts and was prepared in the Thai language, which was most suitable for the understanding of respondents. The first part contained screening questions which confirmed that the right target population was chosen.

In the second part, respondents were asked their demographic profiles. The third part, respondents were asked their own vehicle characteristics and fuel consumption by using closed-ended question as adapted from Isarasaena-Na-Ayutthaya, Rongviriyapanith, Vichearnsan, and Sanyaluklurchai (2006).

In the fourth part, the social influence attitude used 13 questions based on a five point Likert scale, ranging from strongly disagree (1) to strongly agree (5). In the fifth part, NGV attributes consisted of 32 questions which are also based on Likert five point scales method asking degree of agreement.

The last part, the researchers aimed to measure the level of consumers' behavior intention in which a Likert 5 point scale was used ranging from definitely not (1) to definitely (5). At this point, there is an open-end question for respondents to share their opinions or suggest on NGV.

**Table 2: Summary of Hypotheses Testing**

<b>Null Hypotheses Statements</b>	<b>Significant level</b>	<b>Results of null Hypothesis testing</b>
<b>H1:</b> There is no difference in the behavior intention when segmented into separate consumer locations	.000	Reject
<b>H2:</b> There is no difference behavior intention when based on gender	.286	Failed to reject
<b>H3:</b> There is no difference behavior intention when segmented by age ranges	.014	Reject
<b>H4:</b> There is no difference behavior intention when determined by personal income scale	.006	Reject
<b>H5:</b> There is no difference in the behavior intention when determined by types of vehicle	.386	Failed to reject
<b>H6:</b> There is no difference in the behavior intention when segmented by life-times of vehicle	.203	Failed to reject
<b>H7:</b> There is no difference in the behavior intention when based on types of engines	.004	Reject
<b>H8:</b> There is no difference in the behavior intention when determined by engine powers	.477	Failed to reject
<b>H9:</b> Environmental concern has no relationship with behavior intention	.000	Reject
<b>H10:</b> Help country in savings has no relationship with behavior intention	.000	Reject
<b>H11:</b> Government support has no relationship with behavior intention	.000	Reject
<b>H12:</b> Risk from the number of users has no relationship with behavior intention	.136	Failed to reject
<b>H13:</b> Price perception has no relationship with behavior intention	.000	Reject
<b>H14:</b> Cost of setting/maintenance of vehicle has no relationship with behavior intention	.000	Reject
<b>H15:</b> Product performance has no relationship with behavior intention	.000	Reject
<b>H16:</b> Product safety has no relationship with behavior intention	.000	Reject
<b>H17:</b> Availability of NGV has no relationship with behavior intention	.000	Reject
<b>H18:</b> Time consuming of NGV has no relationship with behavior intention	.000	Reject
<b>H19:</b> Credibility of organization has no relationship with behavior intention	.000	Reject
<b>H20:</b> Information has no relationship with behavior intention	.000	Reject
<b>H21:</b> Appearance has no relationship with behavior intention	.000	Reject

## RESULTS AND CONCLUSION

The majority of respondents were male and of single status, were government or state enterprise officers, aged above 50 years old, with bachelor degrees or equivalent, having income levels between 10,001-20,000 Baht. According to the summary of findings in the previous section, the results of SPSS (statistical package of social science) analysis show that sixteen out of twenty one null hypotheses in five groups are rejected, except for hypotheses two, five, six, eight, and twelve. This indicates that there are differences in the consumer behavior intention when determined by different living locations, age levels, and income levels whereas gender is insignificant. Also, there is a difference in the consumer behavior intention when segmented by types of engines whereas types of vehicle, life-times of vehicle and engine powers are not different. It can be concluded that the differences in most of the demographic characteristics lead to the discrepancy in the consumer's behavior intention towards NGV while differences in vehicle factors hardly affects their behavior intention.

In addition, there are relationships between three variables in terms of social influence i.e. environmental concern, help country in savings, and government support toward behavior intention, whereas risk from the number of users variable has no relationship. It must be noted that all variables in the product attributes i.e. price perception, cost of setting/maintenance of vehicle, product performance, product safety, availability of NGV, time consuming, credibility of organization, information, and appearance have a relationship with behavior intention. It is quite evident that the consumers give a higher level of importance to each of the product attributes than to each of the social influences. It can be concluded that consumers pay more attention to overall product attributes than social influences.

## RECOMMENDATIONS

It is very important to know precisely the factors affect consumers' decision to use NGV. Therefore, it is recommended that the PPT management team implement a strategy for the development of their NGV operations to better serve the needs of future consumers. The recommendations are detailed as follows:

1. Recommendation for differentiated studies (geographic locations, demographic factors, and vehicle factors): The hypothesis testing results of group A to C show that the difference in geographic, demographic factors (age levels and personal income levels), and vehicle factors (types of engine) reflects the difference in behavior intention. They also identify the possible main target groups in terms of four segments which are as follows: Firstly, geographic location segmentation, people who have the intention to use NGV are those who live outside the Central area because they have higher scores in terms of behavior intention. Presently PTT has expanded the NGV and refueling infrastructure focusing on Greater Bangkok and the provincial areas along the natural gas pipeline route and along the super highways (www.ngv.org, 2007). PTT should not ignore the people in other areas because they are one of the main target groups. Hence, the researchers recommend PTT to expand the operations throughout the center along with the Central area because NGV service station network should cover the area where NGV users are assured of convenience in refueling facility. Secondly, demographic



segmentation, the consumers who tend to use NGV are mature people whose ages are 42 years old and up. According to a previous local journal (Marketeer, 2006), it has been reported that the number of this age group are on the increase to an approximate 14 million or 20% of the total Thai population. Moreover, the purchasing power of this group is 3 times higher than people in their 30s. It must also be noted that 75-79% of the people aged 50 years old and above have an average income of about 40,000 Baht per month. Thus, NGV product has an opportunity to grow in the future. Furthermore, people in this group do not have to take care of their children anymore and more than one fourth of them are divorced or single, and also have full power to make a decision. Therefore, PTT should concentrate on such factors as safety and appearance that can convince people of this group to make a decision to use NGV. Thirdly, in terms of segmentation of vehicle's engine types, diesel engine users are the main target of PTT because this group is the one with the highest intention. Therefore, PTT should promote more in-use diesel-powered vehicle conversion. The researchers suggest that PTT should promote NGV via television's transportation & technology programs in order to give the information that can stimulate increased use.

2. Recommendation for relationship studies (Social influences, NGV attributes): Although the results show that almost all the hypotheses have some minor relationships between each variable of the social influences and NGV attributes towards the behavior intention, there are three variables that need particular focus: product performance, product safety, and appearance. These factors seem to be the most attractive and can influence consumers' behavior intention; moreover, they are part of the product attributes. To summarize, most of the product attribute factors have higher correlations with behavior intention than the social influence factors. Therefore, the researchers suggest that PTT should concentrate on the product itself especially product performance, product safety, and appearance to increase the number of NGV users until they can achieve their targets. For high impact factors, safety and quality control are of the crucial concern for the consumers. All precautionary measures should be taken to avoid any occurrence of accidents, such as CNG tank explosions, which are very effective in scaring people away from using NGV. PTT should arrange training programs on a regular basis for their installation and maintenance personnel to assure their high quality and performance standard to the general public. In addition, PTT should arrange the seminar workshop on a periodical basis for imparting correct knowledge about NGV to the people who are involved, and organize the NGV product in order to distribute the accurate information on NGV to the consumers in the same direction. Then, the company should use the media or communication strategy to continuously feed factual information on NGV products to avoid misunderstandings about NGV. Both measures will enhance the good image of the product and the PTT organization.

## REFERENCES

- Ajzen, I. (1991). The theory of reasoned action model. Organization Behavior and Human Decision Process, pp.165-178
- Au, Alan Kai-ming. and Enderwick, P. (2000). A cognitive model on attitude towards technology adoption. Journal of Managerial Psychology, Vol.15, No.4, pp. 266-282



- Berkowitz, M., Gallini, N., Miller, E. and Wolfe, R. (1985). Disaggregate Analysis of the Demand for Gasoline. The Canadian Journal of Economics, Vol. 23, No. 2, pp. 253-275
- Blank, S.C. (1984). Practical Business Research Methods, Westport: The AVI Publishing Company, Inc.
- Boyle, G. (2003). Cleaner Fuel for Vehicles. Manila Policy Dialogue on Environment and Transport in Asian Region, pp 1-21
- Buchholz, R.A. (1998). Principles of Environmental Management: The Greening of Business, Prentice Hall, Upper Saddle River, NJ.
- Byrne, M.R. and Polonsky, M.J. (2001). "Impediments to consumer adoption of sustainable transportation alter-native fuel vehicles". International Journal of Operations & Production Management, Vol.21, No.12, pp.1521-1538
- Chilton, K.W. (2000). "Reengineering US environmental protection". Business Horizons, Vol.43, No.2, pp.7-16
- Clift, R. and Wright, L. (2000). Relationships between environmental impacts and added value along the supply chain. Technological Fore-casting and Social Change, Vol.65, pp.281-295
- Contadini, J.F. (2000). Social cost comparison among fuel cell vehicle alternative, Published by the American Institute of Aeronautics and Astronautics, Inc. with permission, pp. 1341-1351
- Crawford, M.C. and Benedetto, C. (2000). New Product Management: (6<sup>th</sup> ed.), McGraw-Hill, Inc., pp.111-113, 246-249, 369-371
- Dearing, A. (2000). Sustainable transportation: the challenge. Annual Review of Energy and the Environment, Vol. 25, pp.90-113
- Dregfus, M.K. and Viscusi, W.K. (1995). Rates of time preference and consumer valuations of automobile safety and fuel efficiency. Journal of Law and Economics, Vol.38, pp.79-105
- D'Souza, C., Tagnian, M., Lamb, P. and Peretiakos, R. (2006). Green pro-ducts and corporate strategy: An empirical investigation. Society and Business Review, Vol.1, No.2, pp.144-157
- Ewing, G. and Sarigollu, E. (2000). Assessing consumer preferences for clean fuel vehicles: a discrete choice experiment. Journal of Public Policy and Marketing, Vol.19, No.1, pp.106-118
- Fin, B. and Suh, Y.G. (2005). Integrating effect of consumer perception factors in predicting private brand purchase in a Korean discount store context. Journal of Consumer Marketing, Vol.22/2, pp.62-71
- Fisk, G. (1998). Green marketing: multiplier for appropriate technology transfer? Journal of Marketing Management, Vol.14, No.6, pp.657-676
- Follows, S.B. and Jobber, D. (2005). Environmentally responsible purchase behavior. European Journal of Marketing, Vol. 34, No.5/6, pp.723-746
- Herrmann, A., Xia, L., Monroe, K.B. and Huber, F. (2007). "The influence of price fairness on customer satis-faction: an empirical test purchases. Journal of Product & Brand Management, Vol.16 No.1, pp.49-58
- Hirunyawipada, T. and Paswan, A.K. (2006). Consumer innovativeness and perceived risk implications for high technology product adoption. Journal of Consumer Marketing, Vol. 23/4, pp.182-198

- Imram, N. (1999). The role of visual cues in consumer perception and acceptance of food product. Nutrition & Food Science, No.5, pp.224-228
- Isarasaena-Na-Ayutthaya, A., Rongviri-yapanith, T., Vichearnsan, V. and Sanyaluklur-chai, W. (2006). Analytical needs of NGV using of Thai people in around Bangkok area. Chulalongkorn Review, Vol. 72, pp.81-90
- Jagdish, N.S. (1999). An Investigation of Relationships among Evaluative Beliefs, Affect, Behavior Intention, and Behavior. Consumer Behavior: Theory and Application.
- Kalafatis, S.P., Pollard, M., East, R. and Tsogas, M.H. (1999). Green marketing and Ajzen's theory of planned behavior: a cross-market examination. Journal of Consumer Marketing, Vol.16, No.5, pp.441-460
- Kazimi, C. (1997). Valuing Alternative-Fuel Vehicles in Southern California. Papers and Proceedings of the Hundred and Fourth Annual Meeting of the American Economic Association. The American Economic Review, Vol. 87, No. 2, pp. 265-271
- Kotler, P. (2003). Marketing Management: International Edition: (11<sup>th</sup> ed.), New Jersey: Prentice Hall
- Lober, D.J. (1997). Explaining the formation of business-environmentalist collaborations: collaborative windows and the paper task force. Policy Sciences, Vol.30, pp.1-24
- Marketeer. (2006). Vol.79, Pg.61-97
- Mason, R.D., Lind, D.A. and Marchal, W.G. (1999). Statistical techniques in business and economics, The Irwin/TheMcGraw-Hill series operations and decision sciences
- Monroe, K.B. and Krishnan, R. (1985). "The effect of price on Subjective Product Evaluation". In Perceived Quality, Eds. J. Jacoby and J Olson Lexington MA: Lesington Books, pp. 209-232
- Monroe, K.B. and Olson, J.C. (1973). "Price as an Information cues: Effect in product Evaluation". In Consumer and Industrial Buying Behavior, Eds. Arch G. Woodside, Jagdish N.Sheth, and Peter D, Bennet. Newyork: North Holland, pp. 267-286
- Natural gas plays a growing role. Business Thailand, March-April, pp. 17-18
- Newhouse, N.L. and Tiller, D.B. (1998). Development of All-Composite NGV Fuel Containers. the NGV '98 International Conference
- O'Donovan, P. and McCarthy, M. (2002). Irish Consumer preference for organic meat. British Food Journal, Vol.104, No.3/4/5, pp.353-370
- Ricci, M., Newsholme, G., Bellaby, P. and Flynn, R. (2007). The transition to hydrogen-based energy: combining technology and risk assessments and lay perspectives. International Journal of Energy Sector Management, Vol.1, No.1, pp.34-50
- Rosenberg, M.J., (1956). Cognitive structure and attitudinal affect. Journal of Abnormal and Social Psychology, Vol. 53, pp. 367-72
- Rowlands, I.H., Parker, P. and Scott, D. (2002). Consumer perceptions of "green power". Journal of Consumer Marketing, Vol.19, No.2, pp.112-129
- Schiffman, L.G. and Kanuk, L.L. (2007). Consumer Behavior: (9<sup>th</sup> ed.), New Jersey: Pearson Education, Inc.
- Sekaran, U. (1992). Research methods for business: A skill-building approach: (2<sup>nd</sup> ed.), New York: John Wiley & Sons, Inc.

- Seligman, L. (2006). Sensemaking throughout adoption and the innovation decision process. European Journal of Innovation Management, Vol.9, No.1, pp.108-120
- Sheth, J. N., Mittal, B., and Newman, B.I. (1999). Consumer Behavior: Consumer Behavior and Beyond, Orlando: The Dryden Press
- Speth, G. (1998). Environmental pollution: high and rising. In Borelli, P. Crossroads: Environmental Priorities for the Future, Island Press. Washington, DC, pp.171-179
- Talukder, M., Harris, H. and Mapunda, G. (2007). Organizational Innovation Adoption: Determinants of the Adoption of Innovation by Individuals within an Organization. Sasin Journal of Management, Vol. 13, No.1, pp.72-88
- Tarkiainen, A. and Sundqvist, S. (2005). Subjective norms, attitudes and intentions of Finnish consumers in buying organic food. British Food Journal, Vol.107, No.11, pp.808-822
- Tepsamrithporn, Gorapin and Chaiya-wat, Kanida. (2001). "NGV: an alternative vehicle fuel". Journal of Kasetsart University Engineering, pp.1-5
- Tse, Alan Ching Bui (1999). Factors affecting consumer perceptions on product safety. European Journal of Marketing, Vol. 33, No.9/10, pp. 911-925
- Vanishbancha, K. (2007). SPSS for windows: (10<sup>th</sup> ed.), Chulabook: Bangkok
- Watson, A., Viney, H. and Schomaker, P. (2002). Consumer attitude to utility product: a consumer behavior perspective. Marketing Intelligence & Planning 20/7, pp.394-404
- Woodruff D., Peterson T., and Miller K.L. (1991). "The greening of Detroit: a push is on to make cars more environmentally friendly". Business Week, pp.54-60
- Yi, Y. (1988). On the evaluation of structural equation models. Journal of the Academy of Marketing Science, Vol.16, Spring, pp. 74-79