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A Factor Analysis of Waste Discarding and Separating Behavior of Thai Premiere League Spectators

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Abstract— **Solid waste is unavoidably generated by many kinds of human activity (Moeller, 2005). Sport is one of the activities that create scores of waste. The purpose of this study is to examine the significant factors of waste discarding and separating behavior of Thailand Premiere League (TPL) spectators in three selected stadiums (i.e., individual factors (IF), knowledge of waste separation (KS), awareness of impact from waste generation (AG), waste reducing participation (WP) and some categories of waste). In addition, the relationship between factors and behavior is scrutinized. Structural equation modeling (SEM) and Path Analysis are used to analyze the responses of 1,155 spectators at selected study areas using AMOS 20 Software package against the various factors of spectators' behavior. The results of the analyses reveal the following: 1) A significant positive relationship between waste discarding behavior and age (IF) and some categories of waste generated in the stadium, for instance, plastic bag, food packaging, can and plastic cup, 2) A significant positive relationship between waste separating behavior and AG, KS, glass bottles, 3) A significant negative relationship between waste separation behavior and plastic bag, can and paper. From a theoretical perspective, this study proposes an integrated model of waste discarding and separating behavior of spectators in TPL and offer recommendations to develop waste reducing awareness among sports organizers.**

***Keywords*—Factors, waste discard, behavior, waste separation, TPL**

I. Introduction

Solid waste is an unavoidable refuse, generated by many kinds of human activity (Moeller, 2005). The high growth rate of human population, an expanding of urbanization and skyrocketing development in production technology have then contributed to an upsurge in the quantity and diversity of solid wastes (United Nations Environment Programme [UNEP], 1991). One important sources of solid waste generated by several human activities is sport. In this regard, mega sporting events at present with a high number of spectators have generated a lot of solid waste from its activities. Woods (1993) described that averaged 50,000 spectators in each game, in the 1992 Skydome baseball stadium in Toronto generated 212.67 tons of solid waste a month. Additionally, five-day of 27th Super Bowl in Pasadena, California generated 74.1 tons of solid waste. Such solid waste, by weight, comprised of 52 percent food-contaminated paper and other unrecyclable waste, 24.5 percent cardboard, 10.8 percent asphalt and concrete, 9.8 percent mixed paper and 2.8 percent aluminum and glass. Schmidt (2006) reported that during the Football World Cup competition in 2006, solid waste was estimated to be 5-10 tons. While the Beijing Olympic Game in 2008 generated 6,386 tons of solid waste and 40,000 tons of hazardous waste (UNEP, 2009).

In Thailand, one of the most popular sports nowadays is football. Football Association of Thailand [FAT] (2012) cited that the highest number of spectators in a single football match between Buriram United and Chiangrai United in 2011 was over 24,000 people. While a number of spectators in the Toyota Thai Premier League in 2011 and 2012 are 2,286 and 2,411 respectively. This figure leads to the number of spectators would be about 1.5 million in the stadium throughout the season. Currently, Thai football is divided into three leagues, namely Thailand Premier League (TPL), League 1 (Division 1) and regional Leagues (Division 2). The leagues run and consist of total 117 teams. Definitely, the number of football matches and activities relevant generate a vast amount of solid waste. Nevertheless an appropriate solid waste management is still deficient in many areas and fields (Medina, 2003). Additionally, the improper solid waste management-related externalities, such as degradation of urban environment, high emission of Greenhouse gases or influence on human health are regularly cited worldwide (U.S. Environment Protection Agency [EPA], 2009).

The purpose of this study was to examine significant factors (i.e., individual factors (IF), knowledge of waste separation (KS), awareness of impact from waste generation (AG), waste reducing participation (WP) and some categories of waste) of waste discarding and separating behavior of Thailand Premiere League (TPL) Spectators in three selected stadiums. The more understanding of what causes the spectators to discard or separate waste while others do not, the more sustainable solid waste management aimed at decreasing waste generation and increasing waste recycling behavior would be possible.

The study on waste discarding and separating behavior is significant searching on the factors which determine the behavior and would continuously lead to sustainable solid waste management model or awareness raising campaign on sustainable solid waste management.

II. Literature review

Human activities produce materials that often turn to be waste. Since, during the production of raw materials and goods until the consumption, waste is generated all along. Though, many of these waste materials can be reused, and

become a resource for production or energy generation, if managed appropriately (Tchobanoglous et al., 2002). Due to rapid economic growth and population growth, Seo, et.al., 2004 reported that the generation rate of solid waste are accelerated. Thus, waste management has become one of the most major problems of all time. Consequently, society is searching for improved methods of waste management and ways to reduce the amount of waste that needs to be landfilled.

Gheewala (2008) stated that in 2008 solid waste recycling and recovery operations in Thailand are carried out 70% by waste pickers and municipal collectors and other 30% by the formal sector. The waste management from the source like the waste separation in households is still limited. Nevertheless, the recycling should be promoted as it would contribute to an increase in waste recycling and reduce the amount of solid waste disposed to a dumpsite. This can also generate income for the households.

Although solid waste problems have recurred everywhere and are difficult to redress, there have many attempts to deal with. For instance, at the FIS Nordic World Ski Championships 2005 in Oberstdorf, there were 20 waste points in and around the stadiums. Local children took care that wastes were collected, separated and prepared for recycling or disposal. More than half of the visitors said that they had noticed waste points, and nearly all these questioned regarded the disposal system as a good idea. Above all, appearances confirmed the success of waste points: the World Championships in Oberstdorf were the cleanest yet (Schmidt, 2007).

There are other interesting ways such as using multi-use products to reduce waste and cost, separating recyclable waste from non-recyclable one, avoiding waste in the spectator's area like the "Put it in a roll" program that a merchandise will put the steak or sausages in a bread roll instead in the plastic or paper plates. These programs can help lessen the amount of waste well while calling for help from media is also important. The media can considerably provide information for spectators more widely and help raise awareness more easily.

The program's achievement in Nurburgring came into the spotlight that they could reduce annual quantities of waste by 40% from 2000 to 2003. Returnable beakers for drinks, waste charges levied on those responsible for waste and organizational measures all contributed to this success. Campers received an environment token on as well as differently colored rubbish bags on entering the site, and are refunded the deposit when the bags were returned together with the token. In addition, car parks and camping area are separated. The result is that considerably fewer sofas, refrigerators and other waste were left behind at camping sites (Tchobanoglous, 2009).

Schmidt (2007) also mentioned on the guide to environmentally-sound large sporting event. He suggested to manage the solid waste around the stadium area by controlling waste-collection behaviors. Another way was to ask for deposit money from spectators to guarantee that the area around their seats will be clean after the game finishes, whereas the deposit money will be given back to them to keep the area clean. Distributing only moderate quantity of flyers, give-away and other promotional articles during an event is also viewed as a way to avoid a lot of waste. Emptying waste containers may probably avoid overflowing waste problem and endanger separate collection concepts. Finally, a control over waste separation in the back stage area like in the kitchen or media rooms is required.

III. Methodology

The study is based on primary data collected with the questionnaire consists of two parts. The first one is personal information and the second one is attitude and opinion of spectators on solid waste management.

The study areas comprised of three football clubs in Thai Premier League.

- SCG Muangthong United Football Club is located in Nonthaburi province. It is a largest team that located near the capital city, Bangkok. The home stadium is SCG stadium where was the first operating football stadium in Thailand. The capacity of the stadium is 17,500 seats. The average spectators in season 2012 were 13,427 people (TPL, 2013).
- Bangkok Glass Football Club is located in Prathumthani province, suburb area. The home stadium is Leo stadium, it is currently used for professional football matches. The capacity of the stadium is 13,000 seats including 12 VIP rooms and other facilities. The average spectators in season 2012 were 7,118 people (TPL,2013).
- Chiangrai United Football Club is located in Chiangrai province. The home stadium is United stadium, it is currently used as professional football matches. The capacity of the stadium is 14,000 seats and other facilities. The average spectators in season 2012 were 8,034 people (TPL,2013).

Respondents of interview by questionnaires were selected by the sampling method (Creswell, 2007) from anyone who attends in the match day including home team supporters and away team supporters. This part of study, the 385 copies of questionnaire was launched to the spectators based on sampling method (Creswell, 2007). The questionnaire comprised of two parts, the first part required personal information of spectators, solid waste discarding behavior and knowledge related to solid waste separation. The second part required opinion of spectators regarding existing solid waste management of the Thai football.

The criteria of the selected study areas are shown in Table I.

Table I: The Criteria used in selecting the study areas.

Characteristics of the areas	Thai Premiere League Football Club		
	SCG Muangthong United FC	*Bangkok Glass FC*	*Chiangrai United FC*
Location	Capital city	Suburb	Province
Spectators	High	High	High
Team development rate	High	High	High

The focus factors are divided into three parts. The first one is individual factors which are comprised of sex, age, status, occupation, income, hometown, team, frequency and consumer goods. The second one is waste categories which are comprised of plastic bag (bag), food package (package), glass, plastic bottle (bottle), aluminum can (can), plastic cup (cup), plastic box, mixed paper (paper) and hazardous waste. The last one is spectators' opinion on solid waste management which are comprised of knowledge of waste separation (KS), awareness of impact from waste generation (AG), waste reducing participation (WP), amount of waste (AW) and sporting venue (SV).

The relationship between factors and behavior was scrutinized. Structural equation modeling (SEM) and Path Analysis were carried out on the responses of 1,155 spectators at selected study areas using AMOS 20 Software package against the various factors of spectators' behavior.

IV. Result and Discussion

The data have been analysis by confirmatory factor analysis and structural equation modeling and the only significant factors are considered which are shown in Figure I.

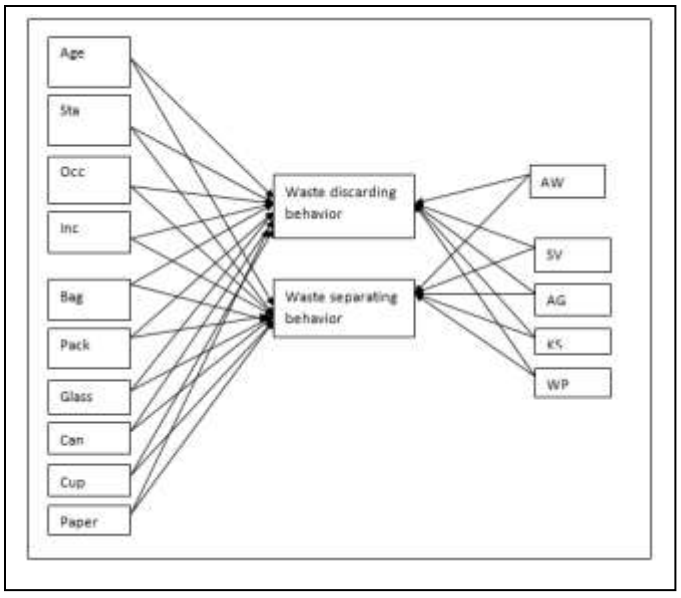

Figure 1. Standardized coefficients of the significant factor which determine waste discarding and separating behavior.

The significant factors are age, status, occupation, income, bag, package, bottle, can, cup, paper, KS, AG, WP, AW and SV. The AMOS 20 Software package is used in order to indicate the linkage of these significant factors and waste discarding behavior and the relationship between the factors and waste separating behavior in each stadium and all stadiums.

The result of the analyses of all stadiums revealed the following:

- SV has a positive correlation with waste discarding behavior at statistical significance. (+3.946)
- Age has a positive correlation with waste discarding behavior at statistical significance. (+4.092)
- Bag has a positive correlation with waste discarding behavior at statistical significance. (+4.113)
- Package has a positive correlation with waste discarding behavior at statistical significance. (+2.892)
- Can has a positive correlation with waste discarding behavior at statistical significance. (+2.721)
- Cup has a positive correlation with waste discarding behavior at statistical significance. (+2.250)
- SV has a negative correlation with waste separating behavior at statistical significance. (-2.425)
- KS has a positive correlation with waste separating behavior at statistical significance. (+4.495)
- AG has a positive correlation with waste separating behavior at statistical significance. (+2.162)
- Bag has a negative correlation with waste separating behavior at statistical significance. (-4.677)
- Glass has a positive correlation with waste separating behavior at statistical significance. (+2.227)
- Can has a negative correlation with waste separating behavior at statistical significance. (-4.935)
- Paper has a negative correlation with waste separating behavior at statistical significance. (-2.447)

The result of the analyses of Chiangai United stadium revealed the following:

- SV has a negative correlation with waste discarding behavior at statistical significance. (-4.496)
- Age has a positive correlation with waste discarding behavior at statistical significance. (+4.247)
- Bag has a positive correlation with waste discarding behavior at statistical significance. (+4.200)
- Can has a positive correlation with waste discarding behavior at statistical significance. (+3.133)
- Package has a positive correlation with waste discarding behavior at statistical significance. (+2.606)

- KS has a positive correlation with waste separating behavior at statistical significance. (+3.945)
- AG has a positive correlation with waste separating behavior at statistical significance. (+2.057)
- Bag has a negative correlation with waste separating behavior at statistical significance. (-4.367)
- Can has a negative correlation with waste separating behavior at statistical significance. (-4.780)
- Paper has a negative correlation with waste separating behavior at statistical significance. (-2.556)
- Glass has a positive correlation with waste separating behavior at statistical significance. (+2.068)

The result of the analyses of Bangkok Glass stadium revealed the following:

- SV has a positive correlation with waste discarding behavior at statistical significance. (+2.032)
- Age has a positive correlation with waste discarding behavior at statistical significance. (+3.683)
- Income has a positive correlation with waste discarding behavior at statistical significance. (+2.088)
- Bag has a positive correlation with waste discarding behavior at statistical significance. (+3.877)
- Can has a positive correlation with waste discarding behavior at statistical significance. (+3.010)
- SV has a positive correlation with waste separating behavior at statistical significance. (+6.298)
- KS has a positive correlation with waste separating behavior at statistical significance. (+4.032)
- AG has a positive correlation with waste separating behavior at statistical significance. (+2.068)
- Age has a positive correlation with waste separating behavior at statistical significance. (+2.026)
- Status has a negative correlation with waste separating behavior at statistical significance. (-1.966)
- Bag has a negative correlation with waste separating behavior at statistical significance. (-4.341)
- Glass has a positive correlation with waste separating behavior at statistical significance. (+2.418)
- Can has a negative correlation with waste separating behavior at statistical significance. (-3.827)
- Paper has a negative correlation with waste separating behavior at statistical significance. (-2.070)

The result of the analyses of SCG Muangthong stadium revealed the following:

- SV has a positive correlation with waste discarding behavior at statistical significance. (+2.270)
- Age has a positive correlation with waste discarding behavior at statistical significance. (+3.736)
- Bag has a positive correlation with waste discarding behavior at statistical significance. (+3.903)
- Package has a positive correlation with waste discarding behavior at statistical significance. (+2.769)
- Can has a positive correlation with waste discarding behavior at statistical significance. (+2.492)
- Cup has a positive correlation with waste discarding behavior at statistical significance. (+2.422)
- SV has a negative correlation with waste separating behavior at statistical significance. (-5.254)
- KS has a positive correlation with waste separating behavior at statistical significance. (+4.751)
- AG has a positive correlation with waste separating behavior at statistical significance. (+2.211)
- Bag has a negative correlation with waste separating behavior at statistical significance. (-4.791)
- Glass has a positive correlation with waste separating behavior at statistical significance. (+2.475)
- Can has a negative correlation with waste separating behavior at statistical significance. (-4.482)
- Paper has a negative correlation with waste separating behavior at statistical significance. (-2.146)

According to the result, age and sporting venue are significant factors correlated with waste discarding behavior. The older spectators have more potential to discard the waste in the stadium. While, plastic bag and aluminum can in the stadium cause more waste discard in every stadium.

At Chiangrai United stadium and SCG Muangthong United stadium, food package has some influence on waste discarding behavior. However, only at Bangkok glass stadium, the spectators who have higher income could cause more waste discarding. In addition, only at SCG Muangthong stadium, plastic cup affects the increasing of waste discarding.

The analysis result demonstrate that the factor of knowledge of waste separation (KS), awareness of impact from waste generation (AG), plastic bag, aluminum can and paper significantly effect on waste separating behavior in several ways. However, more knowledge and awareness lead to more separating behavior. The result conforms to the research of McCarty (1994) which stated that a greater understanding of the antecedents of recycling behaviors would be extremely useful.

From a theoretical perspective, this study developed waste reducing awareness and proposed an integrated model of waste discarding and separating behavior of spectators in TPL.

The result supports an ability to design more sustainable solid waste management, public service and educational programs aimed at increasing recycling behavior.

v. Limitation of the study

The limitations of this research are related to the study areas. The selected study areas are only three stadiums out of eighteen stadiums around Thailand. Thus, the result could not be variety. Moreover, the respondents of the study mostly are the spectators while other stakeholders such as players, staffs, sponsors also generate solid waste in the stadium.

vi. Conclusion

Solid waste is an unavoidable refuse, generated by many kinds of human activity (Moeller, 2005). The high growth rate of human population, an expanding of urbanization and skyrocketing development in production technology have then contributed to an upsurge in the quantity and diversity of solid wastes (United Nations Environment Programme [UNEP], 1991).

The purpose of this study was to examine significant factors (i.e., individual factors (IF), knowledge of waste separation (KS), awareness of impact from waste generation (AG), waste reducing participation (WP) and some categories of waste) of waste discarding and separating behavior of Thailand Premiere League (TPL) Spectators in three selected stadiums.

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