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Attitude and behavioral factors in waste management in the construction industry of Malaysia

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ABSTRACT

In Malaysia, there has not yet been any widely published research that has described contractor attitudes and behaviors regarding waste management including waste reduction, reuse and recycling. Taken together, these attitudes and behaviors are crucial to understanding how construction waste management problems might be resolved. As the Malaysian construction industry is still labor-intensive, the attitudes and behaviors of individuals involved in this industry influence its growth and performance. This paper intends to provide insights on how contractor attitudes and behaviors affect waste management in the construction industry of Malaysia. A structured questionnaire survey was implemented in order to interview local contractors. This paper utilizes logistic regression analysis to assess the relationship between various factors affecting contractor attitudes and behaviors regarding waste management. The results show that contractor attitudes and behaviors regarding waste management tend to differ based on the size of the contractor, which is indicated by its group or category. Contractors that have positive attitudes toward waste management also have satisfactory behaviors, supporting Ajzen's theory of planned behavior. The important and significant factors that affect contractor attitudes toward waste management include contractor size, source reduction, reuse and recycling measures, frequency of waste collection, staff participation in training programs and waste disposal method. Factors such as construction-related education among employees, contractor experience in construction works, source-reduction measures, reuse of materials, waste disposal behaviors and attitudes toward waste management are the most significant factors affecting contractor behavior on waste management. These factors influence contractor attitudes and behaviors and are necessary to effectively improve waste management, growth and performance, as well as to reduce the environmental degradation of the construction industry.

1. Introduction

Construction and demolition (C&D) debris frequently comprises 10–30% of the waste received at many landfill sites around the world (Fishbein, 1998). According to McGarth and Anderson (2000), wastage rates within the UK construction industry may be as high as 10–15%. Construction waste contributes a large amount of solid waste generation in Australia (Lingard et al., 2000; Teo and Loosemore, 2001; McDonald and Smithers, 1998) and in the United States of America (Alexander, 1993; Helper, 1994) and Canada (Kalin, 1991). In Malaysia, the average amount of municipal solid waste generated was approximately 1.2 kg/day in 2000 (Agamuthu, 2001). The sources and quantities of municipal solid waste vary among local authorities in Malaysia depending on the township size and level of economic standards. The amount generated may range from 45 tonnes/day of municipal solid waste (MSW) in Kluang, which is a small town in a southern part of Peninsular Malaysia, to 3000 tonnes/day in Kuala Lumpur (Agamuthu et al., 2004). In the last two decades in Malaysia, extensive building and infrastructure development projects have led to an increase in construction waste generation. A study by Mohd Nasir et al. (1998) showed that 28.34% of waste comes from industrial and construction waste in the Central and Southern regions of Malaysia. As the construction industry develops, it generates substantial construction waste in Malaysia, which significantly impacts the environment and causes increased public concern among local communities. The environmental effects of the industry are directly related to the quality and quantity of waste it generates. Construction waste can significantly affect the performance and productivity of an organization (Alwi et al., 2002). In addition, Skoyles and Skoyles (1987) demonstrated that construction and demolition waste have become a burden to clients, as they must eventually bear the costs of waste. Thus, construction waste management has become important for improving the performance of the construction industry (Egan,

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Table 1
Summary of studies on attitudes and behaviors regarding waste management.

Themes of previous studies	Sources
Role of knowledge in recycling	Barr (2007), Tam and Tam (2006), Maycox (2003), Barr et al. (2001a), Perrin and Barton (2001), Taylor et al. (2001)
Characteristics of the recycler and non-recycler	Vining and Ebreo (1990), Oskamp et al. (1991), Coggins (1994), Tucker (1999)
Relationship between waste generation, types of construction project and methods of construction	Tam et al. (2007a,b, 2005, 2004), Formoso et al. (2002), Bossink and Brouwers (1996)
Attitudes toward waste minimization	Kulatunga et al. (2006), Saunders and Wynn (2004)
Gaps between attitudes toward recycling and actual behavior	Chung and Poon (1994), McDonald and Ball (1998), Perrin and Barton (2001)
Factors that influence waste minimization and recycling behavior	Tam (2008), Tam and Tam (2008), Barr (2007), Kulatunga et al. (2006), Tonglet et al. (2004), Emery et al. (2003), Parfitt et al. (2001), Phillips et al. (2002), Davies et al. (2002), Loosemore et al. (2002), Lingard et al. (2001), Teo et al. (2000), Skoyles and Skoyles (1987)
Difficulties and barriers to waste management and recycling	McDonald and Oates (2003), Maycox (2003), Read (1999), Teo and Loosemore (2001), Tam and Tam (2006)

1998; Kulatunga et al., 2006). Thus, it is necessary to understand contractor attitudes and behaviors regarding waste management in the construction industry.

This paper intends to provide insights on how contractor attitudes and behaviors affect waste management in the construction industry of Malaysia. The second section of this paper reviews previous studies on attitudes and behaviors toward waste management. The third section describes this study's research methodology. Findings are presented in the fourth section, which include a logistic regression analysis of contractor attitudes and behaviors and a number of factors affecting such attitudes and behaviors. The final section provides a discussion and addresses the policy implications of this research.

2. A brief review of studies on attitudes and behaviors regarding waste management

Generally, attitude is a positive or negative feeling toward specific objects; it exerts an influence on behavior. Whether consciously or not, behavioral decisions are frequently based upon attitudes (Fabrigar, 2004). Herremans and Allwright (2000) demonstrated that posture, which includes awareness and attitude, leads to action and performance (behavior) regarding environmental management issues. Recent research on municipal solid waste management has focused on household participation and attitudes regarding recycling behavior. Maycox (2003) demonstrated that understanding behavior is critical to minimizing municipal solid waste, but there are very significant barriers, such as a lack of knowledge among the general public as well as social norms that adversely affect waste practices. Kulatunga et al. (2006) mentioned that for the successful implementation of waste management measures, a collective effort from all involved parties is important. Teo and Loosemore (2001) found that attitudes toward waste reduction are one of the reasons for difficulties in waste management in the construction industry. Loosemore et al. (2002) and Skoyles and Skoyles (1987) both highlighted the importance of human factors in the minimization of waste and both argued that waste can be prevented by changing attitudes. Teo et al. (2000) stated that the labor-intensive nature of construction activities means that behavioral impediments are likely to significantly influence waste levels. Tam et al. (2007a) showed that different types of construction projects have different levels of waste generation. Lingard et al. (2001) also stated that the extent to which reduction, reuse and recycling of waste can be achieved depends, to a large extent, on motivational influences on the behavior of construction workers. Taylor et al. (2001) discussed knowledge, attitudes and perceptions in the context of municipal solid waste management in Malaysian households. The key themes that have emerged from the literature review are summarized in Table 1. Since the Malaysian construction industry is still labor-intensive, the attitudes and behaviors of those involved in this industry influence its growth and performance. However, in Malaysia, there has been no widely published research that has described contractor attitudes and behaviors toward waste management. Taken together, these attitudes and behaviors are critical in understanding how to resolve issues surrounding construction waste management.

3. Method

3.1. Survey design and sampling method

A structured questionnaire survey was used to collect data by interviewing respondents from Klang Valley area who are registered as local contractors with the Construction Industry Development Board of Malaysia. A purposive stratified random sampling method was used. In the first stage of sampling, the study selected samples of contractors that were involved in general building and construction activities within the construction industry. Then, the samples were divided into three groups according to the seven categories of contractors, so that Group A included G6 and G7, Group B included G4 and G5, and Group C included G1, G2 and G3. This grouping was carried out in order to sort the sample by paid-up capital, tendering capacity and minimum personnel resources (details are provided in Appendix I) (CIDB, 2002). Finally, the survey was given to 130 contractors, with 35 from Group A, 35 from Group B, and 60 from Group C. Interviews were conducted using a structured questionnaire that was pre-tested and subsequently modified. The following attributes were included in the final questionnaire:

- General characteristics, such as contractor type and size;
- Waste collection and disposal systems;
- Waste sorting, reduction, reuse and recycling practices;
- Employee awareness, education and training programs;
- Attitudes and perceptions toward construction waste management and disposal;
- Behaviors with regard to source reduction and the reuse and recycling of construction waste.

3.2. Logistic regression model (LRM)

This study employed logistic regression analysis (Long, 1997; Gujrati, 2003). As such, the models presented here assess the relationship between various factors and contractor attitudes and behaviors regarding waste management. Two dependent variables are designed as dichotomous dummy variables, because we assume that attitudes are either positive or not and that contractor behaviors are either satisfactory or not. The model is as follows:

$$\mathrm{Log}\frac{P_i}{1-P_i} = Z_i = \beta_0 + \beta_i X_i + e,$$