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Attitudinal and behavioural approaches to improving waste management on construction projects in Australia: benefits and limitations

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This research aims to understand the attitudes and behaviours of stakeholders towards waste management and consequently identify ways of improving waste management practices in construction projects. Semi-structured interviews were conducted. The findings reveal that most of the decisions in construction projects are based on their financial returns unless there is a special requirement to comply with Green Star or any other sustainable building rating system. Even though there is a trend towards environment-friendly construction, contractors are favourable towards methods involving financial incentives. Results also indicate that private developers are more price-driven compared with government clients. Findings reveal the necessity of enforcing legislation to improve waste management practices until such practices become culturally embedded in organizations across the supply chain. Similarly, end users' motivation towards waste management was also identified as a key to encouraging stakeholders of construction projects and improving their attitudes and behaviours towards waste management practices.

Keywords: attitudes; behaviours; construction projects; waste management; Australia

Introduction

Waste generation in the construction industry

The construction industry is one of the major consumers of energy and natural resources (Ding 2008; Merino et al. 2010). The industry involves construction, renovation and demolition activities that generate a considerable amount of waste annually and have adverse environmental effects (Hao et al. 2008; Jaillon et al. 2009; Manowong 2012; Tam & Hao 2014; Yuan et al. 2012). In the construction context, Shen et al. (2004) defined construction waste as:

Building debris, rubble, earth, concrete, steel, timber, and mixed site clearance materials, arising from various construction activities including land excavation or formation, civil and building construction, site clearance, demolition activities, roadwork, and building renovation.

According to Dajadian and Koch (2014), construction waste generation has adverse impacts on both the environment and financial sectors. Adverse environmental impacts of the construction industry include land deterioration, generation of solid waste, greenhouse gas emissions, dust and noise (Yuan 2013). As Braungart (2013) has observed, as a result of industrialization, the industry is currently practising cradle-to-grave patterns of material flow without much consideration of environmental impacts. This is opposed to the cradle-to-cradle approach, which aims to produce no waste as it is based on the closed-loop nutrient cycles of nature (McDonough & Braungart 2003). When it comes to the Australian context, construction and demolition waste has been estimated to contribute around 25.8% of overall landfill (Australian Bureau of Statistics 2011). According to Graham (2010), buildings account for one-third of resource consumption globally, including 12% of fresh water use and 40% of energy consumption, while producing 30% of greenhouse gases and 40% of solid waste. As dealing with environmental problems is seen as a pressing global issue (Hopwood et al. 2005), construction waste management has gained increasing attention due to its implications for health, resources and the environment, not only for the current generation, but also for future generations (Tammemagi 1999).

Waste management practices in the construction industry

As evident in current waste management literature, researchers have identified multiple and varied ways of implementing waste management practices (Hao et al. 2008; Tam & Tam 2006). However, many of these practices involve dealing with

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waste generation after waste occurs. Kulatunga et al. (2006) have argued that unlike waste generated from other industries, construction waste generation can be avoided. Furthermore, waste minimization helps to reduce material consumption and resource consumption while prolonging the landfill life (Hao et al. 2011). Thus it is necessary to move forward without blaming and shaming each other for the massive amount of waste generation (Braungart 2013). Braungart (2013) has advocated that 'we need to move beyond our current systematic flaws and realise that nature is not a victim to be coddled, not an opponent to conquer, but rather a partner to work with' (p. xxii). Even though people try to become 'less bad' while attempting to be more efficient and effective in action, the environment suffers due to continuous waste generation (Braungart 2013, p. xxii). There is a famous adage by Albert Einstein (2014) that 'we cannot solve our problems with the same thinking we used when we created them'. Paraphrasing this and applying it to the construction context, Kumaraswamy et al. (2002) have pointed out that the problems of today's construction industry cannot be solved with the same thinking used when we created those problems. In order to move forward with real potential, behaviours, beliefs and current practices have to be changed (Braungart 2013). It is becoming increasingly difficult to ignore the attitudes and behaviours of stakeholders in the construction industry when it comes to waste management. Very few studies have been undertaken to identify the relationships between attitudes and behaviours of construction practitioners and waste management. Similarly, most of these studies have focused on the attitudes of individual key stakeholders towards waste management without looking at the holistic view of waste management by considering the attitudes and behaviours of different stakeholder categories in a single study.

Research studies related to attitudes and behaviours of construction project participants

A few research studies were undertaken at both the Australian and international levels to examine the attitudes and behaviours of key stakeholders in the construction industry. Lingard et al. (1997) conducted a study to identify differences in attitudes between individuals at different levels in the construction company hierarchy towards waste management in Queensland, New South Wales and Victoria. They published the results of this study in 2000, also including the Australian Capital Territory, and found that managers have less positive perceptions with regard to construction waste management than workers do (Lingard et al. 2000). Similarly, Teo and Loosemore (2001) have conducted an attitudinal survey and focus group interviews to investigate operatives' attitudes towards waste in central Sydney and found that operatives consider waste generation due to construction activities inevitable and that there is lack of managerial commitment to waste management. Both of these studies were conducted around contracting organizations and no comprehensive study was undertaken to study the attitudes and behaviours of other key stakeholders regarding waste management in Australia.

In the international context, Kulatunga et al. (2006) have evaluated attitudes and perceptions of the workforce, including project managers/site managers, supervisors, labourers and estimators working in contracting organizations in Sri Lanka by conducting a questionnaire survey. They identified a lack of effort in maintaining positive attitudes and perceptions towards waste minimization and varying attitudes of different working groups towards waste management. But this study also portrays only one side of the story as data collection was restricted to participants from contracting organizations. Based on a questionnaire survey of interrelated organizational waste minimization issues, Osmani et al. (2006) examined the attitudes of architects and contractors to waste minimization in the United Kingdom. They found that internal and external factors constrain waste management practices such as lack of client interest and consideration of waste as an inevitable by-product. In 2008 they published the results of the same study, only including findings related to architects, and asserted that architects do not see waste management as a priority in the design process, even though one-third of construction waste could arise from design decisions (Osmani et al. 2008). In the Malaysian context, Begum et al. (2009) interviewed local contractors to study attitudes and behavioural factors in waste management and found that attitudes and behaviours of contractors vary according to the size of the contractor. To determine the attitudes and behaviours of local contractors in relation to waste management in Palestinian territory, Al-Sari et al. (2012) carried out a survey of contractors' attitudes and behaviours and identified that small contractors have positive attitudes towards waste minimization. They also found that voluntary involvement of local contractors in waste management practices are mostly driven by economic considerations. However, there is lack of comprehensive research investigating the attitudes and behaviours of various stakeholders towards waste management and most studies fail to acknowledge the collective efforts involved in waste management. Therefore, this research seeks to address the current gaps in the body of knowledge by exploring how efforts can be made to improve waste management practices in construction projects by focusing on the attitudes and behaviours of construction project participants across the different stakeholder and working groups by including representatives from client, consultant and contractor organizations.

Literature review

Human factors in waste management

From 2008 onwards, the importance of human factors in waste management has gained more attention from researchers (Yuan & Shen 2011). Researchers have emphasized that it is necessary to consider human factors in waste management while improving waste processing technology and infrastructure (Lingard et al. 1997). As the best solution for construction waste management depends on practitioners rather than waste material itself (Yuan & Shen 2011), it has been argued that construction waste can be effectively managed by changing attitudes rather than changing techniques (Wong & Yip 2004). Similarly, Skoyles and Skoyles (1987) highlighted that the most common causes of construction waste generation can be prevented by changing stakeholders' attitudes. When it comes to the construction site level, Kulatunga et al. (2006) asserted that most waste generation can be prevented by simply changing the attitudes of construction workers due to construction workers' direct or indirect relationship with causes of waste generation. A study by Osmani et al. (2008) also suggested that changing attitudes and understandings about the underlying causes and origins of construction waste leads to better waste management. A study in the Netherlands on the recycling of tin also found that awareness, comprehension, attitudes, intentions and behaviours are facilitating and inhibiting factors in recycling (Kok & Siero 1985). Therefore, understanding attitudes and behaviours towards waste management plays a crucial role in the effective management of construction waste (Begum et al. 2009). However, more recently such approaches have been criticized by researchers like Crompton (2013), who emphasized the necessity of a broader focus on environmental problems rather than a narrow focus on behaviour change approaches.

A study by Teo and Loosemore (2001) reported that attitudes towards waste management vary according to occupational categories. Lingard et al. (2000) found that management have less positive attitudes towards waste minimization than construction workers in construction organizations. Similarly Osmani et al. (2008) argued that architects are less engaged in waste minimization due to a lack of knowledge about what causes design waste generation and the perception that contractors are liable for waste minimization. It has also been found that contractors' attitudes have a direct influence on their behaviour in relation to waste management (Begum et al. 2009). However, contractors' attitudes towards waste management change with their grade and category (Begum et al. 2009; Al-Sari et al. 2012).

Attitudinal and behavioural change in construction projects

Researchers have pointed out that the need for behaviour change emerges when, as a society, it is realized that current practices are no longer working properly (Braungart 2013). However, as change is constant, one would imagine it is possible to find solutions for current issues (Braungart 2013). Social psychologists generally agree that people's attitudes, values and beliefs influence their behaviour (Murray 2013). Supporting this view, Chapman et al. (2013) concluded that individual decisions, values and motivations influence people's behaviours. According to the theory of reasoned action, behaviour is controlled by intention and intention is influenced by attitudes and subjective norms (Bagozzi 1992). Ajzen's (1991) theory of planned behaviour argues that to perform a given behaviour requires intention because intentions capture the motivational factors which influence the behaviour. However, habits, social context and social structure cannot be disregarded as these directly influence individual preferences (Chapman et al. 2013). There are theories around how the behaviours of individuals are constrained by the structure of the society in which they live. Parsons (1961) stated that the existence of structure can be identified when a set of independent phenomena demonstrate exact patterning and steadiness over time. Howarth (2007) indicated the presence of three broad sociological schools of thought around the debate of structure and agency. She pointed out that these schools of thought emphasize either structure or agency, or a combination of the two. Sociologists such as Emile Durkheim, Talcott Parsons and Karl Marx believed that irrespective of how individuals perceived or experienced their society, behaviours of individuals in the society are constrained by the structure of society. Emile Durkheim theorized culture as the 'patterns of action, belief, and sentiment . . . arising from the needs and organization of the social structure rather than from the agent's choice or interpretation of the social world' (Smith & Riley 2009, p. 11). Opposing this view, some sociologists emphasize that individuals are capable of acting in a meaningful way in society and are active in social construction. More recently, sociologists such as Pierre Bourdieu, Anthony Giddens and Jürgen Habermas developed theories to explain the inseparable nature of structure and agency. Habermas (1987) considered societies concurrently as systems and lifeworlds. He identified structure as 'system' and agency as 'lifeworld' because of their power relations. Bourdieu (1977) used the concept of 'habitus' to demonstrate linkages between structural factors and the individual. However, as suggested by Bourdieu (1990, p. 130), there is 'no doubt agents do construct their vision of the world. But this construction is carried out under structural constraints'. Therefore, it is necessary to consider how these concepts of structure and agency affect the attitudes and behaviours of construction project participants.

Similarly, beliefs, values and behaviours that pass through generations are not changeable overnight as they have been stabilized by years of shared experiences and practices (Braungart 2013). Murray (2013) asserted that it is not only internal factors such as attitudes, values and beliefs, but also ‘external’¹ factors like peer pressure, social norms and laws that influence behaviours. However, he mentioned that in order to change unwanted behaviours over the long term and transform them into positive ones, it is necessary to increase positive values, attitudes and beliefs. Similarly, to some extent, performance of behaviours depends on non-motivational factors such as time, cost, skills and cooperation of others which can be broadly categorized under essential opportunities and resources to perform behaviours (Ajzen 1991). Intentions, perceptions of behavioural control, attitudes toward the behaviour and social pressures to perform or not to perform the behaviour (subjective norms) can also help to change behaviours (Ajzen 1991).

Ways of encouraging attitudinal and behavioural change in construction project participants

Researchers have identified different methods to encourage changes in the attitudes and behaviours of construction project participants to minimize waste generation. According to Wong and Yip (2004), meetings can be used to increase awareness of project participants towards waste management. Also involvement of construction workers in waste management can be increased by having regular meetings (Lingard et al. 2000). Murray (2013) identified that training programmes can be used to self-guide people towards sustainability and positively change their behaviours as they activate people’s deeper life intentions instead of manipulating mind sets or behaviours. Knowledge, attitudes and skills transfer through training programmes are mediated by social interaction between management, co-workers and peers (Chapman et al. 2013). However, Lingard et al. (2000) have argued that even though managers think training programmes are effective, construction workers believe they are irrelevant. Chapman et al. (2013) pointed out that improvements in sustainable efforts and outcomes of workers can be seen (both in and out of the workplace) when environmental awareness and actions are embedded in their job roles. A study by Kok and Siero (1985) revealed that attitudes can be changed through communication. Manowong (2012) emphasized that the implementation of relevant policies and regulations helps to enhance the awareness and willingness of contractors to address waste management. However, Yu et al. (2013) found that the implementation of levies and charging systems on construction waste disposal is not effective long-term in improving waste minimization. Lingard et al. (1997) suggested that procedures and policies should address behavioural changes at the construction site level.

Sustainable behaviour-enhancing programmes are often based on information campaigns that rely on behaviour change perspectives such as the ‘attitude–behaviour approach’ and ‘economic self-interest approach’ (McKenzie-Mohr 2013). The first perspective assumes that increasing public awareness of a particular issue and encouraging supportive attitudes towards desired activity helps to change behaviours. However, McKenzie-Mohr (2013) has highlighted that when it comes to sustainable behaviour, education alone has little or no effect. He argued that even though some studies have found that education helps to change people’s awareness and attitudes, it may not result in a change in their behaviour. Therefore, McKenzie-Mohr (2013) concluded that there is little or no effect on behaviour from improving knowledge and changing attitudes. He further added that there are a variety of barriers that can prevent individuals from practising sustainable behaviour and a lack of knowledge and unsupportive attitudes are only two of those. Opposing this perspective, Chapman et al. (2013) found that experiential learning leads to new habits and actively experiencing things is the most effective way to learn about environmental initiatives.

The second perspective is the ‘economic self-interest’ approach which assumes people make decisions after a systematic evaluation of choices and then they select according to their economic self-interest. According to the economic self-interest approach, information campaigns which are aimed at enhancing knowledge and changing attitudes have to focus more on the financial advantages of sustainable activities (McKenzie-Mohr 2013). Lingard et al. (2000) also stated that monetary rewards can be used to improve working attitudes and the efficiency of construction works. In contrast, Crompton (2013) has asserted that most of the behavioural change approaches try to use financial rewards and social status to encourage changes in behaviour even though they are not strongly associated with social and environmental concerns. This approach is widely compatible with economic rationalism and neoliberal ideologies and the argument that the world is made up of rational, self-interested competing individuals that seek to maximize their own interest has been widely challenged, in particular in the social sciences. There is evidence to suggest that the human drive for collaboration is just as strong as the desire for competition and that human beings can be motivated to act against their own interests, as well as being motivated by values which are not solely economic and may operate beyond the level of reflexive consciousness (Bourdieu & Wacquant 2001).

It has been argued that social marketing can be used to change the behaviour of people towards ‘sustainable consumption’ not by highlighting the negative impacts of consumerism, but by highlighting the benefits of sustainable consumption (Muratovski 2013). Poon and Ng (1999 cited in Chen, Li and Wong 2002) found that 68–85% of contractors in

Hong Kong agreed to adopt waste management techniques only when such techniques were demanded by the designers, the specifications, or the clients. Furthermore, there can be both internal and external barriers to participation in any kind of sustainable behaviour and these barriers vary according to the different types and categories of sustainable activity such as recycling and resource reduction, etc. (McKenzie-Mohr 2013). However, there is still a lack of comprehensive research on the attitudes and behaviours of construction project participants towards waste management and how waste management can be improved by changing destructive attitudes and behaviours. Therefore, this research aims to explore the attitudes and behaviours of participants working on construction projects relating to waste management along with the potential to improve waste management practices in construction projects by changing the attitudes and behaviours of stakeholders of construction projects. The next section explains the research methods of this research.

Research methods

This research project involved the conduct of interviews with construction project participants to gather data related to current waste management practices in South Australia. As described by Bennett (1991), interviews allow an in-depth and in-breadth examination of problems. Interviews can be ‘unstructured and free-ranging, . . . or they can be structured around questions and issues determined in advance, based on theoretical principles, pre-conceived ideas or prior investigation’ (Bennett 1991, p. 101). This research was designed to include perspectives of different stakeholder categories to capture the holistic view of attitudes and behaviours of project participants related to waste management in construction projects. Thus, semi-structured interviews were carried out and 16 interviews were conducted with construction stakeholders including architects, clients, construction managers, design managers, development and technical managers, engineers, facilities managers, general managers, quality, health, safety, environment (QHSE) managers, sustainable advisors, waste contractors and waste programme coordinators who are working in commercial construction projects in South Australia. Participants had a minimum of 10 years’ experience in the construction industry and at least five years’ experience in waste management. Initial contact with interviewees was made through the academic and industry networks of researchers who were involved in this research and through a snowballing process – each participant was asked to nominate interviewees for interviews. As per Walter (2010, p. 138), snowball sampling is used to access those from hard-to-reach groups by asking respondents to suggest other prospective interviewees to the researcher. This technique also helps to shorten the time and costs involved in the data collection and particularly increase the likelihood of identified people participating in the interviews (Sadler et al. 2010). Thus this process ensured that the selected interviewees were experienced and knowledgeable about construction waste management practices. Interviews were conducted during June and July of 2013. Figure 1 shows the details of interviewees and interviewees, labelled using alphabetical letters from ‘A’ to ‘P’.

As interviews were semi-structured, questions varied according to the answers of respondents in order to obtain a holistic view on waste management practices. In order to avoid loss or misrepresentation of data, interviews were tape-recorded with the permission of the interviewee. Data was internally validated and code-based content analysis was used for data reduction and concept identification. Content analysis is ‘a technique for gathering data, it involves codifying qualitative and quantitative information into pre-defined categories in order to derive patterns in the presentation and reporting of information’ (Guthrie et al. 2004, p. 287). Interview data management and analysis was performed using NVivo 10 computer-assisted qualitative data analysis software. The findings of this research are discussed in the next section.

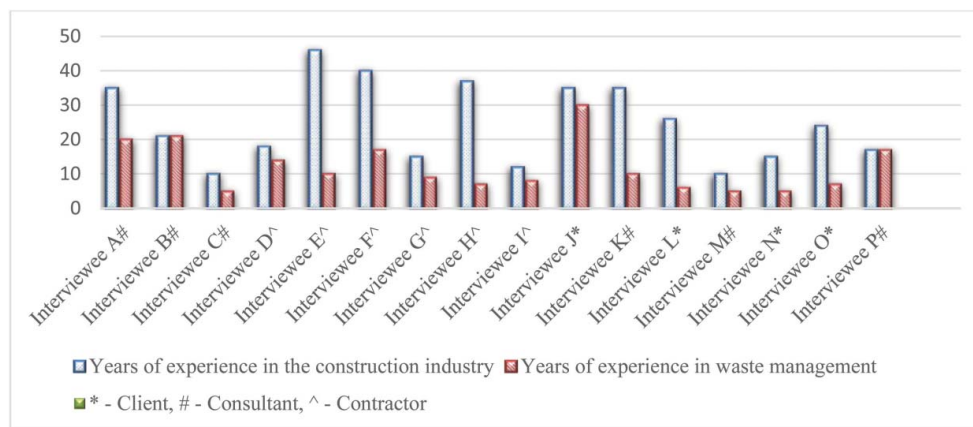


Figure 1. Details of interviewees.

Research findings

The following sub-sections describe the findings of this research, such as the cost-driven nature of the construction industry, attitudes and behaviours of construction project participants towards waste management, and ways of improving attitudes and behaviours towards waste management in construction projects to enhance current waste management practices.

Cost-driven nature of the construction industry

As shown in Figure 2, from interviews it was found that most decisions in construction projects are made based on their financial returns. As described by Interviewee E, the construction industry is a structured industry which operates against environmental concerns. Value for money is a main consideration in construction projects as clients are interested in the end product and the 'bottom line'. Even though there is a trend towards environmentally friendly construction, interviewees highlighted that contractors are in favour of practices which have financial incentives for them. For example, Interviewee N emphasized the difficulty in measuring social and environmental impacts of waste management compared with financial outcomes of waste management. Interviewee G pointed out that especially when the construction industry is in recession; it is even harder to concentrate on environmental issues as they have to find ways to survive in the industry. In accordance with this view, Interviewee A stressed that:

Unfortunately we are driven by our hip pocket . . . if I can show someone that it's going to save their money, then they will think about it. It is like voting in elections. People take notice when it affects their pockets.

In support of this perspective, Interviewee E mentioned that at the end of the day the commercial reality of the industry quite often overtakes all other aspects of construction projects. Therefore, it can be concluded that even though there are trends towards environmentally friendly construction, decisions related to waste management practices often depend on their commercial viability due to the highly competitive and cost-driven nature of the construction industry.

Attitudes and behaviours of construction project participants towards waste management

According to interviewees, clients play a major role in influencing decisions relating to the implementation of waste management practices in construction projects, as clients fund the projects and play a major role in decision-making processes. Interviewees pointed out that compared to private clients, government clients are more favourable towards environmentally friendly construction. However, Interviewee H argued that if clients have both a development and occupation role, then they are more committed to waste management than when they only have a development role. Interviewee D criticized the practices of private developers such as selecting the lowest bidders for construction projects without much concern about their waste management performances. However, he stated that in government projects they do have prequalification procedures to select potential contractors and waste management is also part of this. Interviewee J stressed that clients' commitment on waste management depends on their attitudes towards the environment. Interviewee A also said that 'at the end of the day, less informed clients will simply look at it and say will [it] cost me more or . . . less. . . informed clients will look at . . . the payback period'.

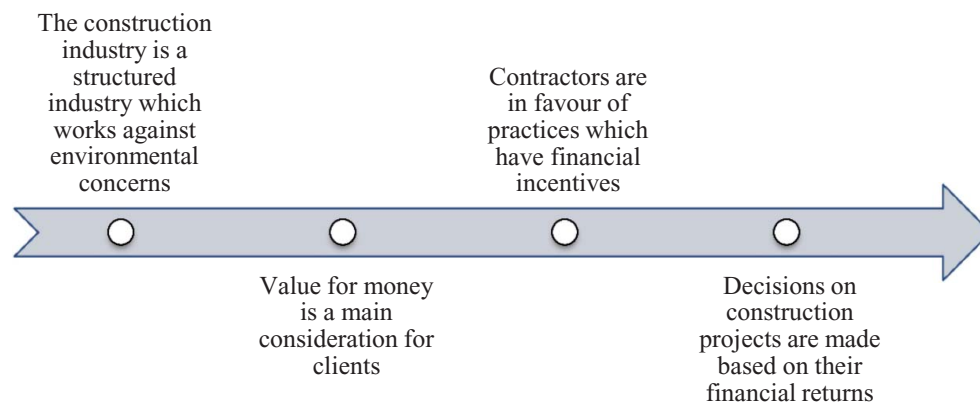


Figure 2. Cost-driven nature of construction projects.

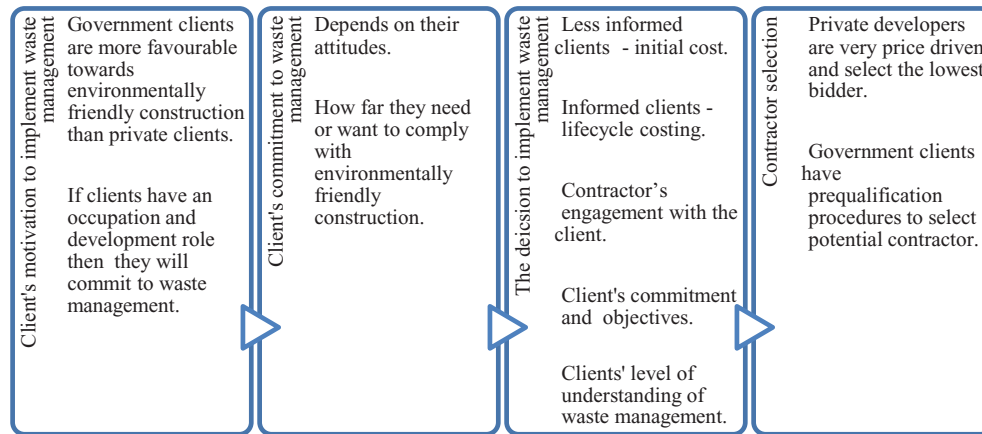


Figure 3. Involvement of client in waste management practices.

Interviewee H stated that influencing clients to implement waste management practices is a difficult task. He said that it depends on the contractor's engagement with the client, the objectives of the client, the client's level of understanding of waste management and how committed the client is to implementing waste management practices. Interviewees pointed out that clients do consider waste management but it is not the number one priority in construction projects. Interviewee J mentioned that waste management is definitely recognized as one of the main site controlling issues and construction managers have to demonstrate to clients that they have this under control, as clients are conscious of site safety. Interviewee M also pointed out that it is necessary to change the attitudes of clients who are not in favour of recycled materials. Interviewee G noted that the commitment of clients always comes with money. Interviewee J also asserted that most of the time the design team has good attitudes towards waste management but it is necessary to change clients' attitudes towards waste management as it is the client's brief which provides advice to the designer that may or may not include environmental considerations. These findings suggest that clients' attitudes have a major influence on the implementation of waste management in construction projects.

Figure 4 shows the different attitudes of stakeholders towards waste management. As stated by Interviewee E, in general the attitudes of construction professionals do not support the implementation of proper waste management practices in construction projects. He asserted that waste management imperatives do not reach down to the lower level of organizations as a result of less interest from senior management in waste management. Interviewee P also stated that especially at the management level, financial benefits are the main motivational factor for the implementation of waste management practices in construction projects. Interviewee O said that designers do not consider the possibilities of waste minimization in construction unless they have to comply with building rating tools such as Green Star. Interviewee E pointed out the necessity of improving builders' attitudes towards waste management. He mentioned that contractors generally hesitate to implement reuse and recycling practices in construction projects due to safety concerns. Interviewee P also mentioned that

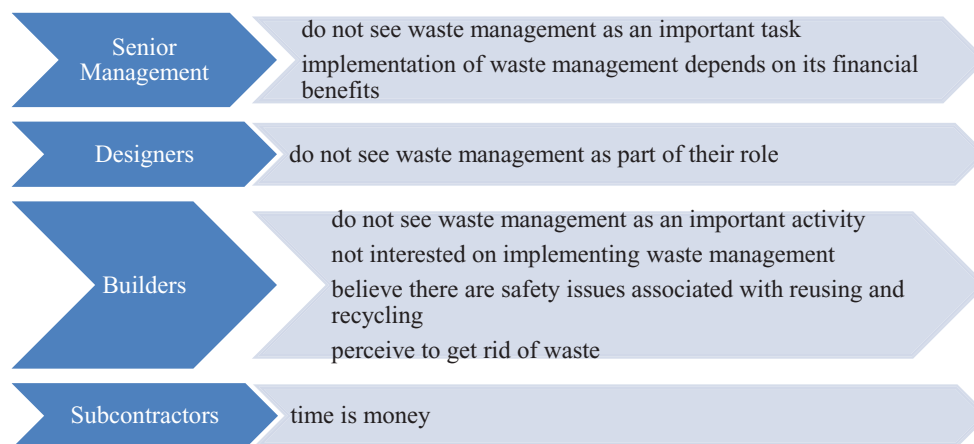


Figure 4. Attitudes of construction project participants towards waste management.

there is no major incentive for contractors to implement waste management practices and a lack of understanding of the potential value of waste. He said that in general there is always the 'attitude that it's waste ... rubbish ... no it's not ... that's money to somebody'. Interviewee L criticized the practices of contractors and said that they are not committed to the implementation of waste management practices in construction projects without economic interest unless they have to comply with legislation or contract requirements. Interviewee D said that:

as a contractor we need to satisfy our own procedures ... but then we tailor that to meet our clients' demands ... so we [are] aware that [the] client requires high levels of compliance ... we are able to meet that because we understand what they want. In other instances it becomes much more cost driven ... we find different solutions that more cost effective.

Interviewee J agreed and added that builders seek out all possibilities for saving money in construction projects. He added that subcontractors do not have much interest in waste management either, as 'time is money' for them. Therefore, he mentioned that instead of passing on waste management responsibility to subcontractors, builders have to make sure subcontractors are complying with waste management practices in construction projects. At the same time, three interviewees specifically stated that some reusable and recycled materials cannot easily be used as new materials and sometimes there is no guarantee of their quality. As a result there is a resistance to reuse and the use of recycled materials in construction projects. Interviewee L mentioned that sometimes even when clients are willing to pay for the extra costs, contractors are not interested in implementing waste management in construction projects. Interviewees highlighted that personal behaviours and attitudes also affect waste management practices. For example, Interviewee B said that some people are less concerned about tidiness than others and they are going to be less disciplined about where and how different types of waste are collected and disposed of. Therefore, it can be argued that most of the attitudes and behaviours of construction project participants do not support waste management as they are restricted by professional roles and financial returns. This focus must change if waste management performance in construction projects is to improve.

Changing attitudes and behaviours towards waste management in construction projects

As described in the previous section, most of the attitudes of construction project participants do not support waste management practices and it is important to focus on changing attitudes. Some interviewees believed that in order to change attitudes and behaviours towards waste management, it is necessary to enforce these changes through legislation. Interviewee A also said that legislation can be used as an initial step towards changing underlying attitudes to waste. However, he pointed out the importance of encouraging involvement in waste management voluntarily rather than by force. Interviewee M also pointed out that implementation of waste management in construction projects should be driven by legislation. And Interviewee E stated that the usual approach is to enforce changes until they become automatically and culturally embedded in organizations. He mentioned that lessons can be learnt from the way safety programmes were implemented in construction projects, and argued that while it is necessary to have enforcement processes initially he does not think legislative enforcement of waste management is going to work by itself. He added that 'legislation with penalties associated with it ... is just using the stick ... and needs a carrot process with it as well.' Interviewees emphasized that to successfully implement anything in the construction industry, it has to affect the senior management level of organizations along with clients. Interviewee E mentioned that this kind of legislation will motivate contractors and will drive cultural change in waste management until this becomes a habit. Furthermore, he mentioned that things which are continually affirmed in the building industry need to be driven by head contractors and professional associations. However, Interviewee M stressed that people do not always like to be told what to do. She further pointed out that too much legislation also diminishes innovation. Therefore, she said that 'people wanted the guidance rather than legislation. Because they wanted to be able to ... still create their ideas and innovation'.

Interviewees C and I highlighted that education is vital in the process of changing attitudes and behaviours of construction practitioners towards waste management. Agreeing, Interviewee H commented that it is necessary to enhance educational processes and associated areas to implement better waste management practices in construction projects. Interviewee I said that educational programmes related to waste management can be carried out at schools to educate the next generation about waste management. However, Interviewee A emphasized that it is necessary to conduct more research into waste management to prove that waste management has cost-effective outcomes in terms of capital expenditures, ongoing costs and energy consumption. He also mentioned that it is necessary to raise social consciousness in order to change attitudes and behaviours towards waste management at the grassroots level of society.

Furthermore, interviewees emphasized that in order to change attitudes and behaviours towards waste management there need to be joint actions and incentives. They highlighted that the benefits of waste management have to be mutual. Interviewee G said that 'if there is incentive for using recycled materials ... absolutely longevity and sustainability will be

there. If it is not, then it is only left to the personal preference'. Interviewee G pointed out that common interest will only prevail when benefits of waste management are explained to the people who are actually doing waste management and when it is placed in contract specification. Interviewee M mentioned that not even the general public is interested in using recycled materials because people normally focus on cost. She stated that the price of recycled materials should be competitive and should have a similar quality to virgin materials. Furthermore, Interviewee M stressed that waste management should be driven by the procurement side of buildings. She added that if the drive comes from the person who is purchasing the end product, then the builders will be motivated to implement waste management as they have to survive in the construction industry. Interviewee J agreed, mentioning that the hidden parties in the implementation of waste management are occupants or end users. However, Interviewee D emphasized that to achieve a cultural shift it is necessary to have internal drivers as it is very difficult to affect culture from external drivers.

Discussion

The findings of interviews suggest that the attitudes of industry practitioners toward waste management in construction projects varied; however, generally they were not very positive despite significant efforts made in recent decades to advocate for improved construction and demolition waste management. This is a worrying sign and measures need to be in place to further promote environmentally friendly construction practices as well as improve levels of awareness of industry practitioners. Clients and government play a crucial role in this process.

Similarly, results showed that most of the decisions in construction projects are based on their financial returns and clients play a major role in influencing the implementation of waste management practices in construction. These results are consistent with study of Osmani et al. (2006), which found that waste management practices are constrained by clients' interests. Another important finding was that designers do not always consider waste minimization in construction unless they have to comply with building rating tools such as Green Star. This finding supports those of Osmani et al. (2008), which suggested that architects are less engaged in waste minimization. It was also suggested that there are no major incentives for contractors to implement waste management practices and subcontractors do not have much interest in waste management either, as time is money for them. This supports previous research by Al-Sari et al. (2012) which found that voluntary involvement of local contractors in waste management practices is mostly driven by economic considerations. The results of this study indicate that there is a resistance to reuse and the use of recycled materials in construction projects which is also supported by Wong and Yip (2004). In this study, research participants suggested that it is necessary to enforce changes in waste management through legislation and that education is vital in the process of changing attitudes and behaviours of construction practitioners towards waste management. In accordance with the economic self-interest approach (McKenzie-Mohr 2013), interviewees emphasized that incentives are also important to reduce waste generation in construction. According to research findings, waste management practices are restrained due to lack of economic interest, professional roles and less accountability of construction stakeholders. Thus the Green Building Council of Australia could improve its rating tool to address the abovementioned three factors to improve waste management practices. In addition, as South Australia is one of the leading states in waste management, the findings of this research are likely to be of interest to other states in helping to improve their waste management practices. However, research participants also argued that it is important to raise social consciousness in order to change attitudes and behaviours towards waste management at the grassroots level of the society. As would be expected in a highly competitive and profit-driven industry, issues associated with costs and financial management were highlighted as key in determining waste management practices. This illustrates how structural factors constrain the voluntary involvement of construction practitioners in waste management activities. As such, the study also points to the importance of addressing systemic issues of political economy, including the externalization of environmental and ecological costs and the pursuit of endless growth on a planet with finite boundaries and resources. The next section explains the conclusions of this research.

Conclusions

The findings reveal that even though there are trends towards environmentally friendly construction, decisions to implement waste management practices still depend on their commercial reality due to the highly competitive and cost-driven nature of the construction industry. The empirical findings of this study provide a new understanding of clients' attitudes towards waste management and indicate that the client's attitude is key to waste management and waste management performance depends on how far clients need or want to adopt environmentally friendly construction methods. Findings also reveal that most of the attitudes and behaviours of construction project participants (including clients, designers, builders and subcontractors) do not generally support waste management as they are constrained by the profit driven nature and competitiveness of the construction industry. It was identified that a drive-through legislation is necessary to improve waste management practices until these practices become automatically and culturally embedded in organizations.

Education on waste management practices, incentives to implement waste management practices and equal distribution of the benefits of waste management were also highlighted as better ways to promote changes in the attitudes and behaviours of construction project participants to improve waste management practices. However, the motivation of the end user was also identified as key to encouraging stakeholders of construction projects and improving their attitudes and behaviours towards waste management practices. An implication of these findings is to acknowledge the involvement of both clients and end users in waste management actions while improving and communicating the benefits of waste management to stakeholders through education programmes and regulations. At the same time, results emphasize the importance of embedding efforts aimed at creating changes in attitudes and behaviours within the context of broader efforts aimed at addressing systemic issues of political economy.

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Note

1. The internalization of such 'external' societal forces is explored through Bourdieu's concept of 'habitus'.

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